SOUTHERN POWER AND INDUSTRY

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JANUARY, 1950

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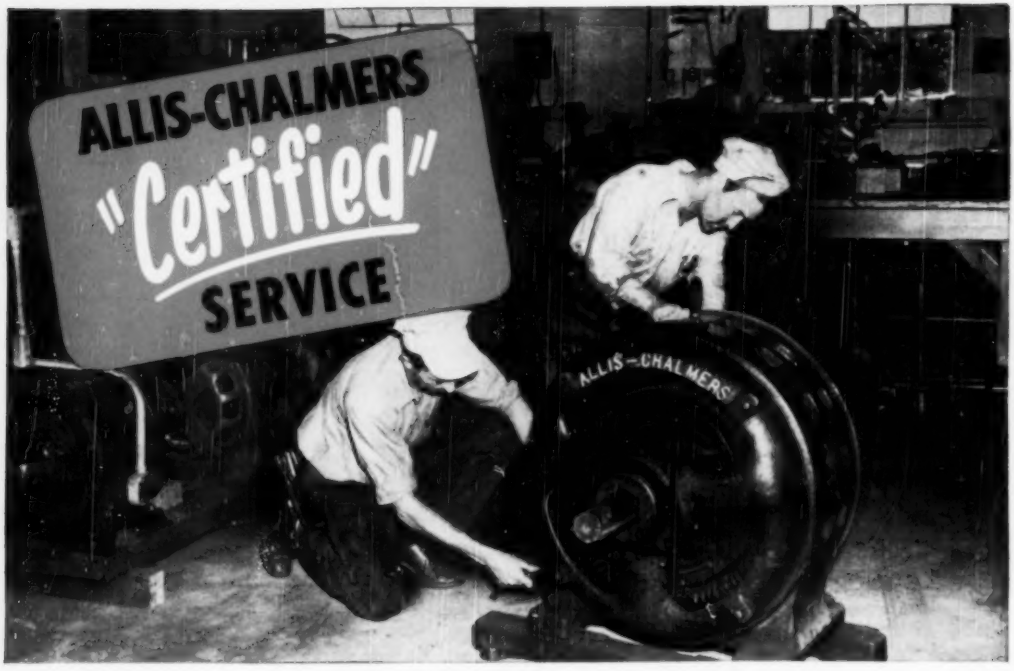

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Entered as second-class matter at the Post Office, Dalton, Ga., under the Act of March 3, 1879.
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Volume 68 Number 1

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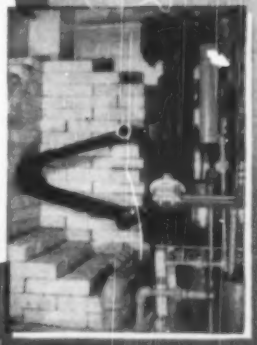
Below — One of the Nalco 1500 p.s.i., gas-fired miniature test boilers, used in antifoam research. Photo made before completion of furnace refractory and insulation.



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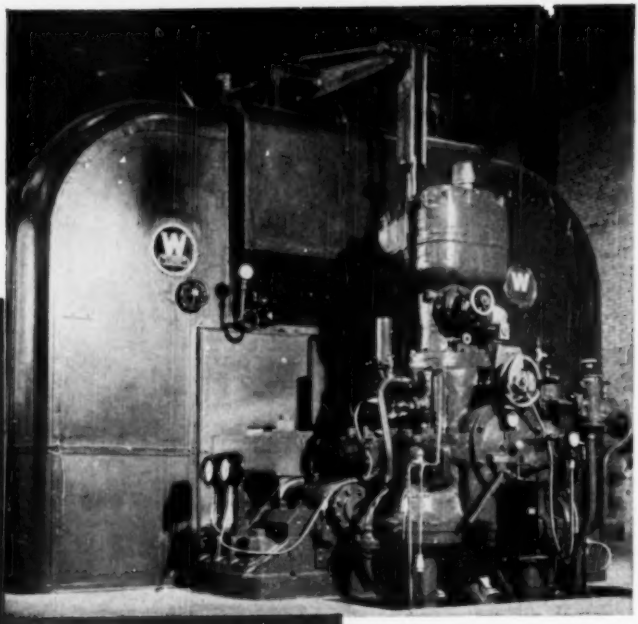

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SOUTHERN POWER AND INDUSTRY

JANUARY 1950

VOL. 68 NO. 1

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Annual Subscription—$1.00
Foreign—$10.00

Published monthly at 115 E. Gordon, Dalton, Ga.
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Publishers also of: *Textile Industries, Electrical South, Southern Hardware, Southern Automotive Journal, Southern Building Supplies.*

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Contents indexed regularly by Engineering Index, Inc.

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Editorial and Executive Offices: SOUTHERN POWER & INDUSTRY, 806 PEACHTREE ST., N. E., ATLANTA 5, GEORGIA

2 New Steam Generating Units for NORTH CAROLINA

SOME of the finest steam generating plants in the country are to be found in American engineering colleges where every facility is available for studying designs, efficiency, dependability, and general performance. Springfield has an outstanding record in supplying steam generators for schools, colleges, and universities.

The design shown here is for two 60,000 lb. units for North Carolina State College of Agriculture and Engineering which is a part of the University of North Carolina. The operating pressure is 425 psig at superheater outlet with 750°F. total steam temperature. Boiler heating surface totals 7,028 sq. ft.; water cooled surfaces, 1,780 sq. ft.; and air heater, 3,700 sq. ft. Firing is by spreader stoker with dumping type grate. The design includes dust collector with forced and induced draft fans.

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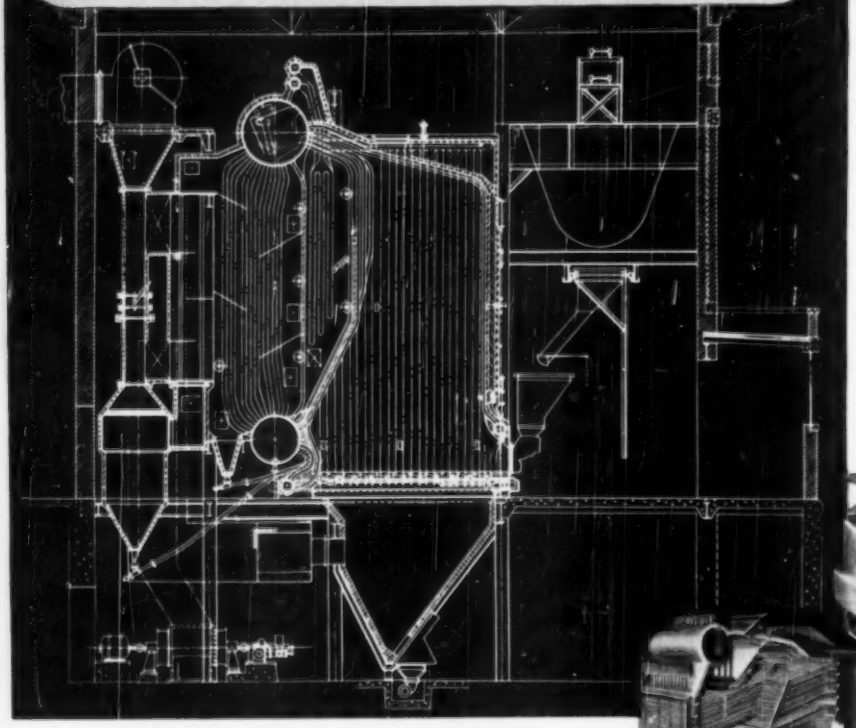

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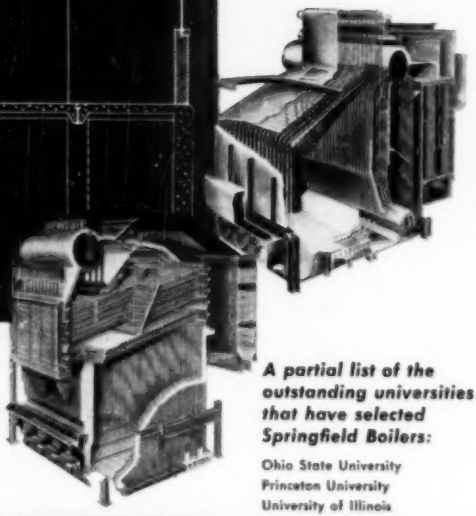

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Facts and Trends

FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

January, 1950

THE SOUTHWEST AIR CONDITIONING EXPOSITION, to be held under the auspices of the American Society of Heating and Ventilating Engineers at State Fair Park, Dallas, Texas, January 23 - 27, will be the only exposition of its kind in 1950. Its list of 200 exhibitors is drawn from all parts of the country. Dallas was selected for the 1950 event because it centerpoints an area in which air conditioning demand is growing more rapidly than in any other part of the country.

NEW BLADELESS-IMPELLER SEWAGE AND TRASH PUMP has highly commendable clog-proof features. Blades of previous impeller designs for such service were responsible for much of the clogging which plagues sewerage disposal plants. New design offers greatly reduced maintenance cost, and improved operational qualities.

Impeller contains a single channel without blades, and the pumping effect is obtained by so twisting and warping the channel as to produce the equivalent of one flow section of a conventional impeller. Additional data on the new clog-proof trash pump is carried in the New Equipment section of this issue of SP&I.

SEMI-OUTDOOR DESIGN, applied to the Lumberton, N. C., coal burning plant of the Carolina Power & Light Company, saved around $700,000 in construction costs. Only the turbines, generators, condenser, and the controls of the new 88,000 kilowatt capacity station are enclosed. The Lumberton plant is the 12th of CP&L's generating stations, and its construction represents a part of the Company's $78 million post war expansion program.

A NEW TYPE GAS ENGINE GAS COMPRESSOR, utilizing the Uniflo scavenging principle, will be installed at the West Monroe, La., station of the Tennessee Gas Transmission Company. Air inlet ports around the entire circumference at the bottom of the cylinder and dual, mechanically operated exhaust valves at the head, are claimed to produce perfect clearance of burnt gases from the cylinder, complete charging with clean air, extremely low exhaust temperatures, and assured load carrying ability.

2,000 LB CAPACITY FORK TRUCKS have been announced to lower and raise heavy loads between balcony storage areas and first floor production lines. A special non-tilt mast and carriage assembly permit the load carrying forks to be lowered 98-in. below balcony floor level. Truck can operate from H-beam runway to reach down to main floor.

A RECENT EDITORIAL FIELD TRIP through the Southwest gave opportunity to talk personally with industrial plant managers, superintendents, and maintenance personnel in Tulsa, Oklahoma City, Dallas, Fort Worth, and Houston. We found high interest in new equipment, methods, and processes that can be economically employed in Southern plants. And we found highest interest of all in "what your neighbor is doing" -- WHAT'S GOING ON INDUSTRIALLY from El Paso, to Miami, to Baltimore. So, SP&I's major effort has been well received. Because of your expressed interest in these subjects, we present here a brief digest of a few Southern and Southwestern industrial developments covered during the past year in our pages.

SOUTH ATLANTIC -- installation of automtic air-puff blowers in FLORIDA POWER CORPORATION'S Turner Plant in Deland, Florida was said to be the first application of this relatively new principle to an oil fired boiler -- THE MACON KRAFT BOARD MILL in Macon, Georgia, processing pine into kraft paper board, made use of the latest recovery and by-product procedures -- BURNS BRICK COMPANY also of Macon, Georgia completely modernized its facilities -- the C&O BOILER PLANT at Huntington, W. Va., reported that flexible equipment allowed the use of a wide variety of coals, assured fuel supply, and reduced operating costs.

THE CAROL-MAY FINISHING COMPANY of N. C., reduced steam costs 32 per cent by reclaiming heat in the steam exhausted from the hosiery preboarding machines -- GEORGIA POWER COMPANY dedicated their 45,000 kw steam-electric station near Albany, Georgia, the first plant this company has installed with outdoor boilers. THE ROCK HILL PRINTING & FINISHING CO., Rock Hill, S. C., installed a new 5,000 kw turbine and is saving $15,000 a year in steam -- WESTERN ELECTRIC COMPANY of Winston-Salem, N. C., reported on a job evaluation technique that eliminates guess work by setting up a definite common yardstick against which different jobs may be measured.

EAST SOUTH CENTRAL -- REPUBLIC STEEL opened its Gadsden, Alabama high pressure pipe mill. Manual handling is virtually eliminated in the country's second plant to produce 24-in. and 30-in. high pressure steel pipe -- MISSISSIPPI POWER & LIGHT COMPANY described its new Rex Brown Steam Station -- carefully selected standard power and steam equipment was installed at HOLLISTON MILLS at Kirgsport, Tennessee. 150 lb process steam is supplied at 72 per cent monthly efficiency. -- Heat loss through pipe hangers was virtually eliminated at the KENTUCKY UTILITIES Tyrone plant, by resting steam line weight on insulation -- At TUBE TURNS, Louisville, maintenance personnel emphasized that they are not burdened with paper work, yet a detailed coding and tabulating system offers readily available and accurate maintenance costs -- At TENNESSEE EASTMAN CORPRATION, Kingsport, Tenn., the urgent need for more capacity and availability of existing facilities made extension more desirable than a completely new plant.

WEST SOUTH CENTRAL -- CELANESE CORPORATION, DOW CHEMICAL, ALAMO POTTERY, and other Southwestern plants employed Silicone liquids, greases and compounds, resins and varnishes in reducing production, materials, and maintenance costs -- the job of bringing sulphur up from 1500 ft below a Louisiana swamp called for something different in a power plant for the FREEPORT SULPHUR COMPANY -- Rehabilitation of the QUAKER OATS COMPANY's Sherman, Texas facility featured a modern distribution system and new boiler plant -- NEWPORT INDUSTRIES' Oakdale, La., plant solved an unusual water treatment problem. Extremely soft water is first hardened slightly, but later has its hardness tied up in order to produce clean, dry steam and keep boilers out of trouble.

DIAMOND ALKALI opened its new Houston facility with an overall daily requirement of 60 million gallons of water and an hourly steam demand of 400,000 lb -- ESSO STANDARD OIL COMPANY's installation of an inland, siphon well type pumping station at Baton Rouge, La., proved highly suitable for very unusual soil conditions in the area -- FORSYTH ENGINEERING CO. in Houston constructed a new plant in which the arc welded tubular frame also serves as air receiver and distribution system -- CENTRAL LOUISIANA ELECTRIC COMPANY's outdoor turbo-generator installation, with turbines exposed to the atmosphere, made the station unique in design and construction.

Modernization of LIBERTY GLASS COMPANY's Sapulpa, Oklahoma plant featured an automatic batch unit 152 ft in height -- CONSOLIDATED VULTEE AIRCRAFT in Ft. Worth noted how engineers can handle diversified maintenance jobs with not over half a dozen carefully selected adhesives -- The coal gasification unit of MISSOURI GAS SYNTHESIS PLANT at Louisiana, Mo., started to convert coal to synthetic liquid fuels -- the first experimental gas turbine pipe line pump unit was temporarily installed at WILMAR, ARKANSAS to test feasibility of a unit of this type being used in transportation of natural gas -- one of the first major applications of "exposed" chemical plant construction was the CORN PRODUCTS REFINING COMPANY's new Corpus Christi plant -- the country's first central station gas turbine, a 3500 kw, G.E., simple-cycle, unit, in OKLAHOMA GAS & ELECTRIC COMPANY's Huey Station at Oklahoma City, exceeded all expectations in the first four months of actual service operation.

Write the editors for additional information on any of the above items.
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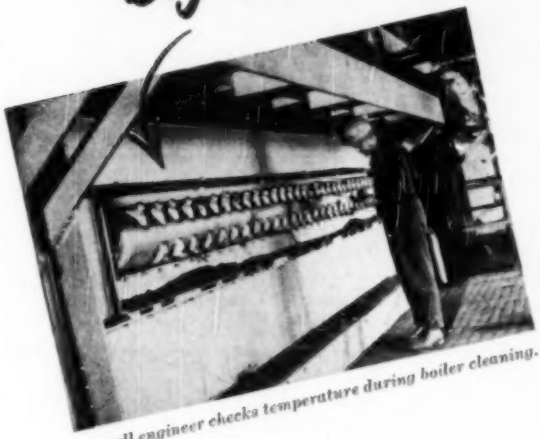

Dowell engineer checks temperature during boiler cleaning.

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A TYPICAL EXAMPLE of the economies afforded by Dowell Service is reported in the case of a midwestern refinery using five 300,000 lb. per hour boilers to generate electrical power. Before Dowell Service was used in the plant, boilers were usually down two weeks whenever repairs became necessary—during which time electricity was purchased from an outside source. Using Dowell Service to do the internal surface cleaning, the boiler is back in use in one week instead of the usual two! And the Dowell part of the operation takes just one day!

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3 STACKS, FANS, DUST COLLECTORS FOR POWER AND INDUSTRIAL PLANTS — Catalog 200 — Application data and illustrative views of Thermix fan-stacks, fans, tubular and duplex dust and soot collectors, multicyclones, and recirculators for flue gas control. — FRAT-DANIEL CORPORATION and THERMIX ENGINEERING COMPANY.

8 SOLID ROTOR BACK PRESSURE TURBINE — Bulletin S-116 — Describes the Terry solid wheel rotor turbine and its various applications, particularly those of back-pressure.—THE TERRY STEAM TURBINE CO.

11 WATER TUBE BOILERS — Bulletin, 12 pages—Illustrates and describes special and standard power plant boilers and packaged steam generators. Complete engineering data, dimensions, illustrations, etc.—SPRINGFIELD BOILER CO.

29 COAL CRUSHERS AND PULVERIZERS—Data Sheets — Give important facts on the efficiency of coal preparation in power plants using American rolling ring crushers, giving improved combustion and reduced ash pit losses through low cost uniform coal sizing.—AMERICAN PULVERIZER CO.

36 INTEGRAL FURNACE BOILERS — Bulletin G-64 describes Type FS integral furnace boilers which respond to quick steaming and severe load swings, with high dependability and wide variation in fuel.—THE BABCOCK & WILCOX CO.

39 BOILER GIRTH SEAM PROTECTOR —Bulletin 5-A—Describes the application of National Boiler girth seam protectors in gaining greater safety, greater economy and greater reliability in fire tube boilers.—NATIONAL BOILER PROTECTOR CO.

47 SPREADER STOKERS—Bulletin SB-31 gives complete details on the design, application and operation of spreader stokers which burn a wide range of coals efficiently and economically, and result from over 100 years of steam generating equipment manufacture.—ERIE CITY IRON WORKS.

87 FIREBOX BOILERS—Catalog 96-E—Describes steel riveted firebox boilers up to 150 lbs swp for all fuels—up-draft series from 25 to 304 hp with 3 in. tubes—from 43 to 304 hp with 4 in. tubes.—KEWANEE CORP.

91 ELECTRICAL PRECIPITATORS FOR COLLECTION OF SOLID AND LIQUID MATTER—Booklet—Describes the various types and applications of Cottrell and electrical precipitators for the collection of solid and liquid matter suspended in hot or cold gases, giving complete engineering data and installation illustrations. — WESTERN PRECIPITATION CORP.

FANS, PUMPS, COMPRESSORS, HEATERS, HEAT TRANSFER

120 CONTINUOUS BLOW-OFF SYSTEM —Publication 4081—The savings possible through continuous blow-off as applied in many modern boiler plants.—COCHRANE CORP.

138 CENTRIFUGAL PUMPS — Bulletin W-305 B1, 12 pages—Describes various types of centrifugal pumps for belt, multi-V belt and other motor drives, with closed impellers — single stage units, for pumping hot or cold water, brine, process liquors, light oils and similar liquids. Specifications, ratings, installations, and dimensions.—WORTHINGTON PUMP & MACHINERY CORP.

142 SEALS FOR PUMPS — Bulletin 49, 12 pages, describes the three types of Byron Jackson mechanical seals for centrifugal pumps—designed for sealing stuffing boxes of pumps handling hot and cold liquids, either corrosive or non-corrosive.—BYRON JACKSON CO., PUMP DIV.

149 VENTILATING FANS—Bulletin Series 700 covers heavy-duty fans for all kinds of industrial ventilating service, meeting tough assignments capably and efficiently. High velocity axial flow air movement, sizes to 60 inches.—Propellair Div., ROBBINS & MYERS, INC.

153 CENTRIFUGAL FIRE PUMP—Bulletin B-1500, 24 pages, gives selection charts, application data, equipment and necessary fittings for both single stage and two-stage fire pumps with different types of approved drives and applications. — PEERLESS PUMP DIV., FOOD MACHINERY & CHEMICAL CORP.

161 CENTEIFUGAL PUMPS — Bulletin 244—Illustrates and describes Warren Type TH, 6 stage, high pressure pumps for boiler feed, pipe line, mine drainage and other high pressure requirements up to 1200 psi.—WARREN STEAM PUMP CO.

182 SELF-CONTAINED DESUPERHEATER—Bulletin 405-A—Describes the Copes desuperheater, a self-contained unit with cooling water control at the spray nozzle and a simple external adjustment for temperatures and sensitivity—easily dismantled for cleaning, and available from 2 in. to 14 in., 125 to 900 lb inclusive.—NORTHERN EQUIPMENT CO.

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215 TEMPERATURE REGULATOR — Catalog 550—Describes Sarco temperature regulator to keep heating coils and heaters at correct temperature—inexpensive. —SARCO CO., INC.

237 PANELS, CUBICLES, BOARDS — Catalog 125-B—Describes many designs of panel boards, instrument panels, switchboards, control cubicles, designed and built for control use in public utilities, power plants, process plants and the like.—FALSTROM CO.

248 SAFETY HEADS—Bulletin describes how BS&B safety heads protect all sorts of industrial vessels. Metal pressure discs are gauged to burst at pressures safely below those of the vessels they protect and guard against damage caused by sticking valves, lack of maintenance, careless operation — simple but positive. — BLACK, SIVALLS & BRYSON, INC.

260 CONTROL VALVES AND TRAPS—Bulletin 245 — Describes control valves and steam traps for particular application in the heating, compressing and operating of molding presses in plastic molding. —W. H. NICHOLSON & CO.

261 BOILER WATER LEVEL CONTROL —Performance report No. 467—Gives the details of boiler water level control at Buzzard Point Plant of Potomac Electric Power Company. — NORTHERN EQUIPMENT COMPANY.

266 COCKS, VALVES AND SWING JOINTS—Bulletin 100-1, 24 pages, describes a complete line of various types of cocks, stop valves, check valves, non-return valves, transfer valves and swing joints, brass and iron, with complete engineering and application data.—BELFIELD VALVE DIVISION, MINNEAPOLIS-HONEYWELL REGULATOR CO.

279 TEMPERATURE REGULATORS — Bulletin 329 gives information regarding the No. 11 self-operated regulator, used on water and oil heaters, tanks, vats, kettles, dryers, process equipment, etc. Tables for selecting proper size illustrate broad scope, and give pertinent application data.—THE POWERS REGULATOR CO.

294 INSTRUMENTS AND CONTROLS FOR PROCESS INDUSTRIES—Bulletin 17A—Describes and illustrates "Custom-Made" control systems obtainable from standard Bailey components for measurement of temperature, pressure, flow and level.—BAILEY METER CO.

295 ADJUSTABLE INCLINED WATER COLUMNS—Bulletin T-1 gives details and applications of adjustable inclined high and low alarm water columns particularly designed for package type boilers up to 300 lb wsp.—Ernstlit package units for package type boilers.—ERNST WATER COLUMN & GAGE CO.

PLANT EQUIPMENT, TOOLS, PROCESS SPECIALTIES

316 TANKS AND VESSELS — Bulletin describes the facilities and products developed through sixty years of manufacture and erection of steel tanks and pressure vessels, smoke stacks, breechings, boilers, and the like for Southern industry.—J. J. FINNIGAN CO., INC.

338 SILICONE RUBBER — "Silastic Facts No. 5," 16 pages—Gives complete data on all commercially available types of the silicone rubber "Silastic"—at present, six pastes and six molding and extruding stocks, for which typical properties are given.—DOW CORNING CORP.

354 STEEL STORAGE TANKS—Bulletin, 4 pages—"Welded Steel Tanks for Oil Storage"—contains a table giving diameters, heights, weights and shell ring thicknesses for standard, flat-bottom tanks in a complete range of sizes from 500 to 150,000 barrels capacity.—CHICAGO BRIDGE & IRON CO.

361 CHEMICAL AND PROCESS PLANT EQUIPMENT — Catalog 122 — Gives application details and installation views of a broad variety of equipment such as air compressors, vacuum pumps, blowers, ejectors, condensers, engines, pumps, air tools for general use.—INGERSOLL-RAND CO.

371 **CRUSHERS, GRINDERS, SHREDDERS** — Booklet — Illustrates American Rolling Ring and Hammermill crushers, grinders and shredders, for metal turnings, coal, stone and a wide variety of friable, semi-abrasive and fibrous materials — also horsepower, speed, weight, floor space, etc.— AMERICAN PULVERIZER CO.

PIPING, VALVES, FITTINGS, STEAM SPECIALTIES, TRAPS

420 **WATER COLUMN GAGES AND ACCESSORIES**—Catalog 46—Describes gages, guards, gage glasses and other accessories for boiler and tank of all pressures. —ERNST WATER COLUMN AND GAGE CO.

432 **CAST IRON STEEL VALVE BODIES** —Bulletin S-1—Describes "D" and "DA" cast steel 3000 lb and 6000 lb cast steel angle and globe pattern, single seated valve bodies with venturi type seat rings.— FISHER GOVERNOR CO.

447 **VALVE OPERATORS, SPROCKET RIMS**—Bulletin 88—Describes and illustrates adjustable sprocket rims with chain guides, and other forms of Babbitt valve operators and controls. — BABBITT STEAM SPECIALTY CO.

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MAINTENANCE, PACKING, LUBRICANTS, WELDING

506 **PACKING IN GENERAL** — Garlock Catalog—Describes packings for high pressures and low pressures—for water, air, steam, acids, solvents, oil and other liquids and gases.—THE GARLOCK PACKING CO.

512 **CLEANING INDUSTRIAL EQUIPMENT**—General information Bulletin on Dowell service for cleaning steam generating, heat exchanger and other industrial equipment, including pipe line and water well acidising. Illustrations, engineering data, details as to methods used.—DOWELL, INC.

529 **LUBRICATING DEVICES** — Broadside 4800 gives important facts about lubricating devices, with valuable application data and detailed equipment descriptions.—TRICO FUSE MFG. CO.

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588 **VALVE DISCS AND PACKINGS**— Bulletin H — Describes Ernst valve discs for high pressure and high temperatures—for compressed pump valves, gaskets, stem packing and other valve and water column accessories. — ERNST WATER COLUMN AND GAGE CO.

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POWER TRANSMISSION, MATERIALS HANDLING

628 **BELT CUTTER**—Bulletin BC-350— The cutting of all widths and thicknesses of belts—and a special tool which gives perfect results. — FLEXIBLE STEEL LACING CO.

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3	8	11	29	36	39	47	87	91	120	138	142	149	153	161	182	202
215	237	248	260	261	266	279	294	295	316	338	354	361	371	420	432	447
459	461	468	474	477	496	506	512	529	533	539	545	551	553	588	599	628
634	653	661	668	670	675	688	718	729	730	754	772	806	807	813	823	845
848	858	875	1006	1007	1009	1021	1024	1026	1040	1045	810	811	812	813	814	815
816	817	818	819	820	821	822	823	824	825	826	827	828				

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675 **ELECTRIC HOISTS**—Bulletin SP-451—Describes the new low priced R & M wire rope electric hoists with adjustable trolley mounting, special high torque hoist motor, single unit housing, and other convenient engineering characteristics.—ROBBINS & MYERS, INC.

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WATER TREATMENT, AIR CONDITIONING, REFRIGERATION

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ELECTRICAL

806 **INDUCTION MOTORS** — Bulletins G-119, G-125—Describe in detail a complete line of induction motors from ½ to 20 hp, 600 to 3600 rpm, and of totally enclosed, fan cooled "Series G" motors for 2 and 3 phase AC circuits. — RELIANCE ELECTRIC & ENGINEERING CO.

807 **SILICONE INSULATION FOR DC MOTORS**—Data Sheet B-50-2—Recommends insulation for the rewinding of D.C. motors to give exceptional protection against high heat and moisture. — DOW CORNING CORPORATION.

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823 **INCREASING PRODUCTION, CUTTING COSTS**—4 page broadside describes 13 ways of increasing production and cutting maintenance costs through intelligent use of fuses, fuse pullers, clamps, fuse clips, oilers, etc.—TRICO FUSE MFG. CO.

845 **CUBICLES, PANELS, ENCLOSURES** — Descriptive Booklet — "Contract Manufacturing in Sheet Metals"—Describes job-fitted control centers, bus enclosures, cubicles, switchgear housing and other sheet metal assemblies for utility and industrial plants.—THE KIRK & BLUM MFG. CO.

848 **PANEL BOARDS** — Bulletin 125 — "Modern Design for Instrument Panels and Cubicles"—describes the facilities and products of Falstrom, backed by long years of service to engineers in the utility, chemical, petroleum and industrial fields.—FALSTROM CO.

858 **INDUCTION MOTORS** — Condensed Catalog No. 166M—Dimensions, ratings and prices, from ½ hp to 3 hp, with complete descriptive information for all types, in accurate and convenient form.—STERLING ELECTRIC MOTORS, INC.

875 **POWER CAPACITORS** — Manual 50-B — Describes power factor improvements and the problems involved, with helpful data and installation on the use of Sprague capacitors for on-the-spot power factor correction at minimum cost. New impregnant permits units 33% smaller.—SPRAGUE ELECTRIC CO.

MISCELLANEOUS

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1024 **IDENTIFICATION NAMEPLATES** —Bulletin "Solve Your Identification Problems"—Shows suggested uses for engraved, plastic nameplates, to give permanent legible marking of switches, valves, gages and controls. Samples available.—INDUSTRIAL NAMEPLATE SERVICE.

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Continued on page 106

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B16	B17	B18	B19	B20	B21	B22	B23	B24	B25	B26	B27	B28				

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A10 A11 A12 A13 A14 A15 A16 A17 A18 A19 A20

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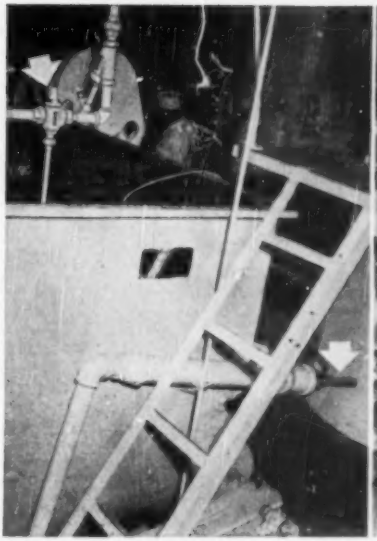
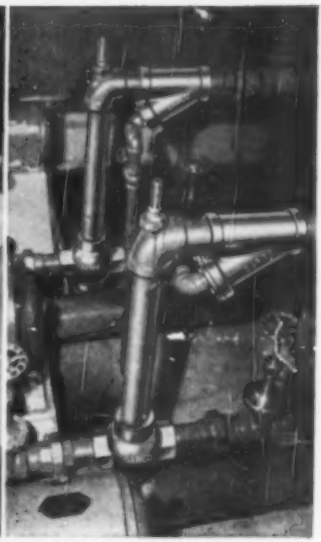
THE COST OF COLD



Sarco TR-21 on can cooling



Sarco Blenders on Diesel engines

It's human to play safe and "open her up wide" when cooling is done by hand control. But what is the cost of too much cold and more cooling water than you need?

In Process Cooling

The cooling hook up above handles forty No. 10 tins of syrups or foods per minute. It's a conveyor job with temperatures critical above sixty degrees. Formerly wide open, for safety, Sarco now opens or closes the valves down to a trickle as needed. Production is uninterrupted and absolutely uniform. Catalog No. 700.

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In Engines and Compressors

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SARCO BLENDER
A three way mixing valve that delivers liquids at constant temperatures regardless of pressures and temperatures in hot and cold supply lines. Catalog Nos. 700 and 800.

ASK FOR SARCO CATALOG No. 700 ON COOLING CONTROLS

257

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2. EASY TO ADJUST SPEED

By adjusting a simple handwheel, the speed setting can be varied within a 30% range. Once adjusted, the DP's hydraulic governor holds speed accurately.

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When steam conditions or load demands change, a DP turbine can be adapted at a reasonable cost for the new requirements if they are within the steam flow capacity of the casing. Example: If it is desired to increase the horsepower rating, the only changes which are usually necessary are new nozzle plate and valve parts. The cost of such parts is far less than the cost of a new turbine—which would be required with a less flexible unit.

REMEMBER...

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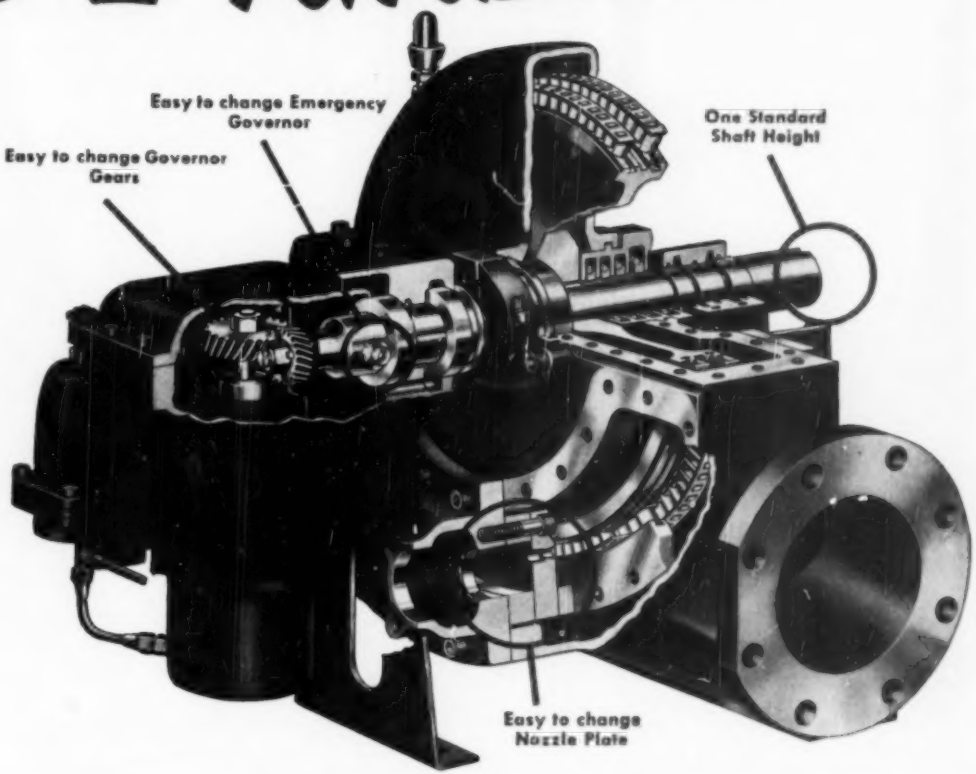

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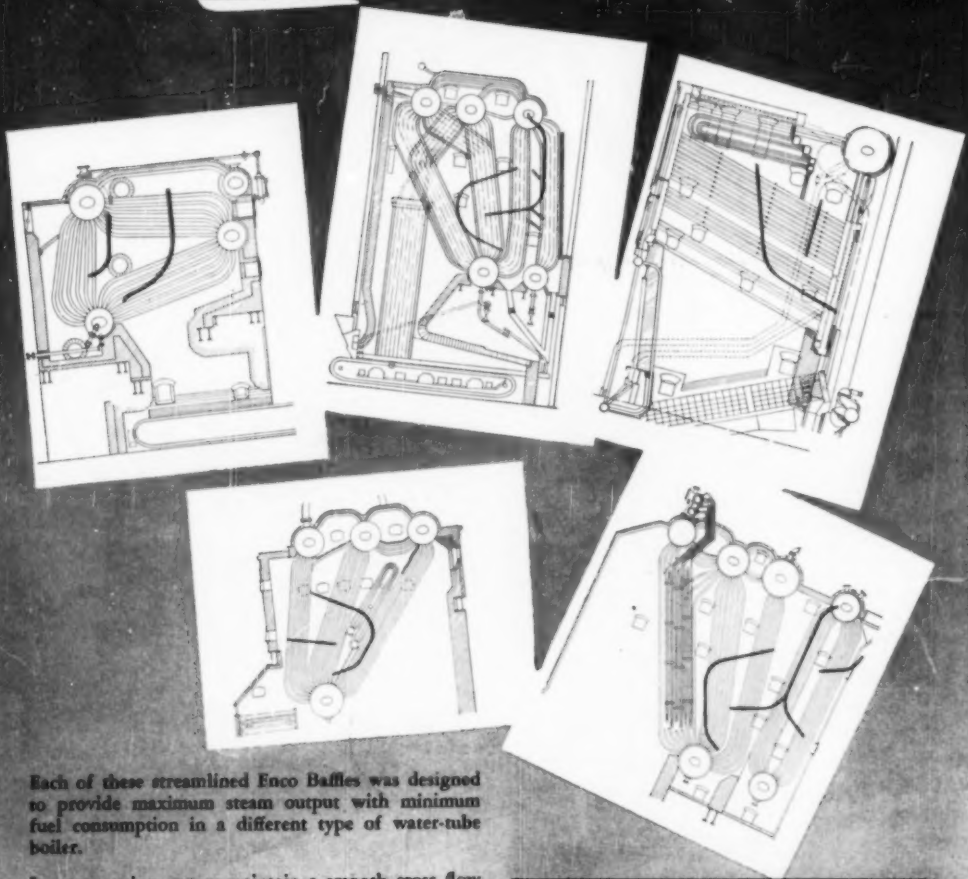
IN EVERY TYPE OF BOILER



Each of these streamlined Enco Baffles was designed to provide maximum steam output with minimum fuel consumption in a different type of water-tube boiler.

Long sweeping curves maintain a smooth cross flow of gases across every square foot of heating surface. Eddy currents, bottlenecks and dead gas pockets are eliminated—draft losses are cut to a minimum. Soot blowers work more effectively, less steam and less time are needed for cleaning.

Enco Streamline Baffles are individually designed and engineered to the exact requirements of your boiler. Experienced Enco-trained crews take charge of the installation.

The 18-page Enco Bulletin, BW44, shows how engineers throughout industry have gotten higher boiler efficiency and increased steam production through the use of Enco Streamline Baffles. Why not write for your FREE copy today?

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BW-472

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Power men have long recognized the value of standardizing on Crane, the **One Source of Supply** complete enough to simplify every piping procedure. **One Responsibility** for materials helps to assure a better installation, avoids confusion and needless delays. And for **High Quality** in every piping item . . . and dependable performance throughout every piping system . . . get Crane Quality, unsurpassed for more than 90 years.

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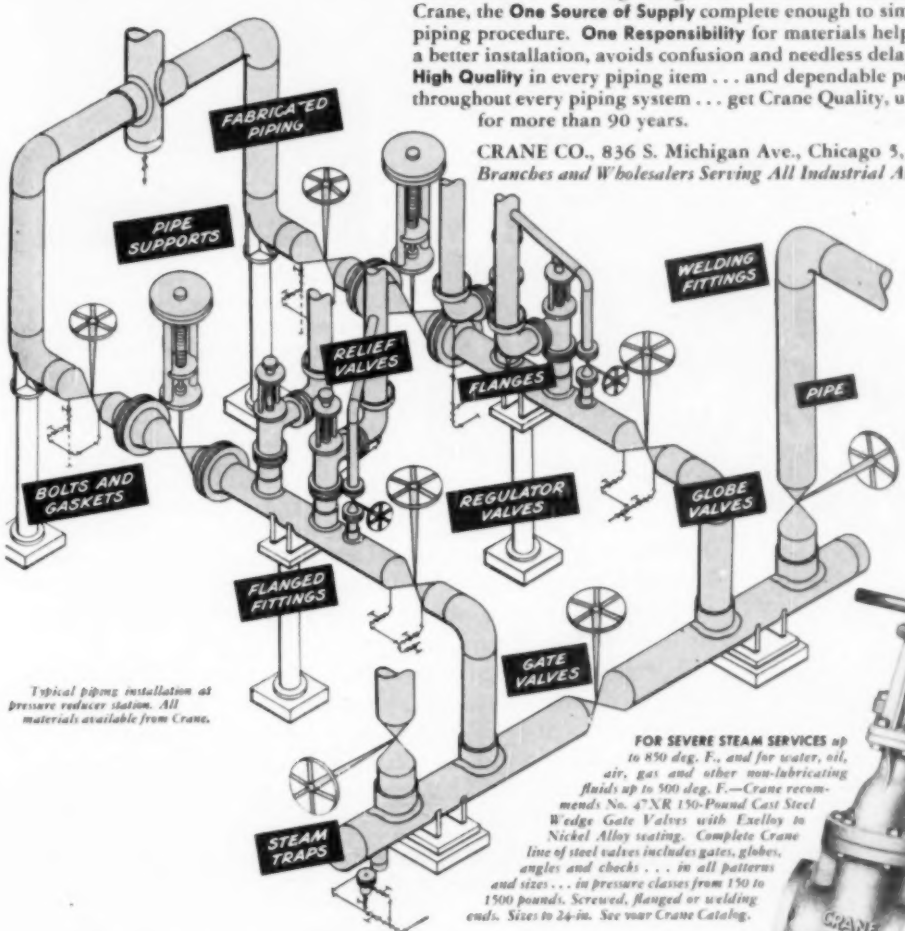

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Which Garlock Gasket keeps joints tight regardless of temperature changes and vibration?

Cross-sectional view of the GUARDIAN gasket illustrates its unique and rugged construction—alternate layers of scientifically shaped strip metal and asbestos. Note the double thicknesses of metal on both the inner and outer edges.

When so ordered, GUARDIAN gaskets are supplied with metal *centering rings* for raised face pipe flanges and other applications.

ANSWER:

GARLOCK Guardian* GASKET

*Reg. U.S. Pat. Off.

Because of its unique structural design, the GUARDIAN gasket compresses and rebounds instantly and repeatedly to conform with expansion and contraction caused by vibration or changes in temperature. Keeps joints *permanently* tight.

For long, trouble-free service, use GARLOCK GUARDIAN gaskets against steam, oils, gases or liquids at the highest pressures and at temperatures up to 1000°F—on pipe flanges, boiler manhole and tube plates, oil refinery equipment or any other application where operating conditions are unusually severe.

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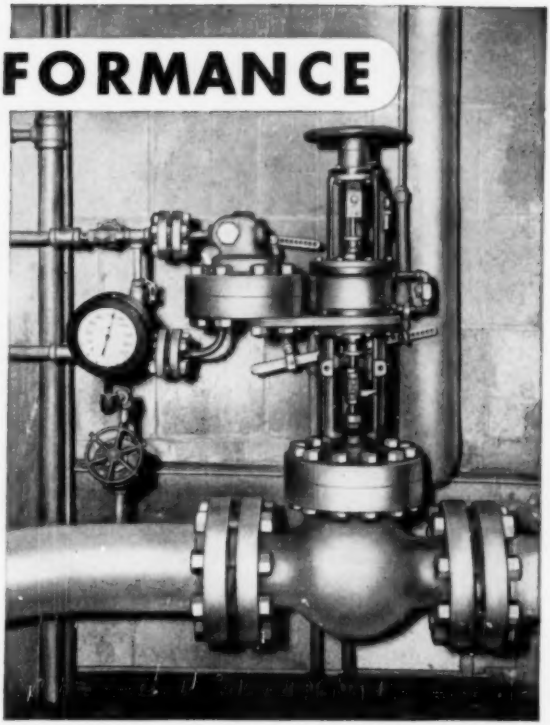


Installed in 1942 at the Bound Brook, New Jersey, plant of the Calco Chemical Division of American Cyanamid Company, this COPES Flowmatic Regulator gave good results from the start—even before combustion was under fully-automatic control—on the 900-psi Riley Type RP boiler rated at 200,000 pounds of steam per hour.

Three years later, Calco installed three more COPES Flowmatics to replace another type of feed water regulator on three older 480-psi boilers, each with maximum capacity of 100,000 pounds per hour. Only routine maintenance has been needed to keep all four COPES Flowmatics giving optimum performance since installation.

COPES Flowmatic Control gives you close control of boiler water level, regardless of range or speed of load fluctuation. Entirely indepdendent of instruments and other controls, it remains on full automatic during periods when they must be out of service for periodic maintenance. Simple and rugged, it handles emergency conditions as safely and dependably as it does normal operation.

These are the reasons why COPES Flowmatics have been ordered for more than 2800 boilers with pressures up to 1825 psi. Why you will find users in all of the 48 states and in 43 other countries. Why operation of your modern high-duty boilers will be safer and more efficient with two-element COPES Flowmatic Control—designed and built for your individual requirements, to fit any piping layout and operating preference.

NORTHERN EQUIPMENT COMPANY
103 GROVE DRIVE • ERIE, PENNSYLVANIA
BRANCH PLANTS in Canada, England, France, Austria, Italy
☆ *Representatives Everywhere* ☆

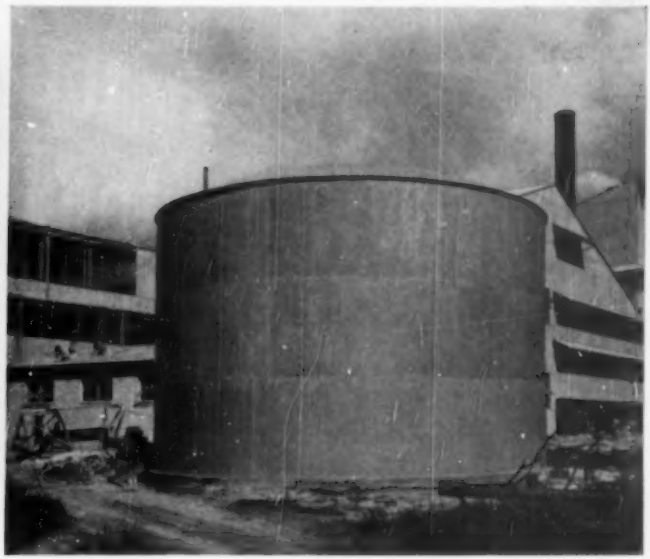
The story of COPES at Calco is told in Performance Report 481. Write for your copy—on your letterhead, please.

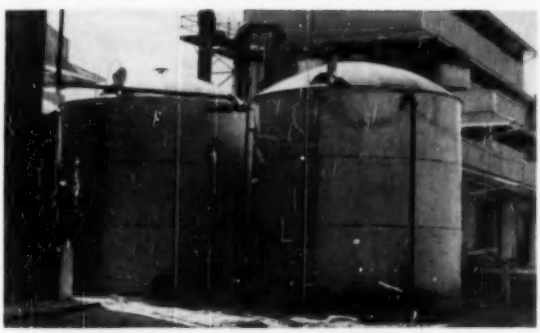
COPES

Headquarters for . . .

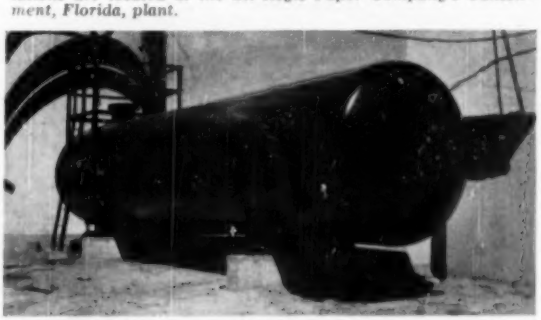
Boiler Feed Water Control . . . Excess or Constant Pressure Control, Steam or Water . . . Liquid Level Control . . . Balanced Valves . . . Desuperheaters . . . Boiler Steam Temperature Control . . . Hi-Low Water Alarms.

Have you the right PERSPECTIVE for 1950?





Above: Two 12-ft. diam. by 15-ft. high caustic storage tanks. Below: 7,500-gal. sulfur dioxide storage tank. Both these installations are located at the St. Regis Paper Company's Cantonment, Florida, plant.



Meet the challenge of a competitive market with MODERN EQUIPMENT that lowers production costs

A recent survey by the National Industrial Conference Board shows that many businessmen will *spend* money to *cut costs* in 1950. Their companies are engaged in long, over-all programs which, though presently calling for higher expenditures, anticipate greater savings through improved techniques, facilities, expansion, and *new equipment*.

Why not adopt this dynamic program in your plant? Take a critical look at your storage tanks and process equipment to see if they are obsolete. Consider also the services we offer for furnishing new steel plate structures that will lower your production cost. Our shops do welding to code requirements, X-raying, and stress-relieving. Special corrosion-resistant linings are furnished when specified. When you decide to modernize for efficiency, contact the nearest office for a quotation on the steel plate structures you need.

Top: 36-ft. diam. by 22-ft. suction tank at the St. Regis Paper Company's plant at Cantonment, Fla.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 2.....2180 Healey Bldg.	Detroit 26.....1534 Lafayette Bldg.	Philadelphia 3.....1646—1700 Walnut St. Bldg.
Birmingham 1.....1531 North Fiftieth St.	Houston 2.....2132 National Standard Bldg.	Salt Lake City 1....1545 1st Security Bank Bldg.
Boston 10.....1044—201 Devonshire St.	Havana.....402 Abreu Bldg.	San Francisco 11.....1231—22 Battery St. Bldg.
Chicago 4.....2107 McCormick Bldg.	Los Angeles 14....1545 General Petroleum Bldg.	Seattle 1.....1345 Henry Bldg.
Cleveland 15.....2218 Guildhall Bldg.	New York 6.....3312—165 Broadway Bldg.	Tulsa 3.....1628 Hunt Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY, *and* GREENVILLE, PA. *In Canada*—HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

You *specify* the service . . . We'll *supply* the RIGHT valve.

This may sound like a broad statement, but we can prove it. Because of the completeness of the Powell Line, we are always able to supply the *right* valves to meet the requirements of every industrial flow control service.

You specify the conditions under which the valve must operate. Usually your Powell distributor will know which is the right Powell Valve to meet them. If the conditions present a problem he can always consult Powell Engineers, or if you prefer, write to us direct.

At all events be sure you install the *right* valves—it's easy to do with the Powell Line.* Failure to do so will mean faulty performance instead of the long, trouble-free operation you can expect from the right Powell Valves.

Fig. 19084 W. E.—Class 900-pound Cast Steel Pressure Seal Globe Non-Return Valve with welding ends and toggle operation. Improved streamline design reduces pressure drop and turbulence to the minimum.

Fig. 1708—200-pound Bronze Globe Valve with screwed ends, union bonnet, renewable, specially heat treated stainless steel seat and regrindable, renewable, wear-resisting "Powellium nickel-bronze disc.

Fig. 11313 W. E. — Class 1500-pound Cast Steel Pressure Seal Gate Valve with welding ends, venturied ports and special by-pass. Bevel gear operation. Also available with top-mounted electric motor operator.

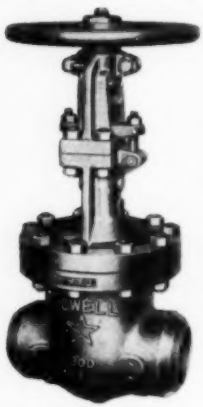


Fig. 3003—Class 300-pound Cast Steel Gate Valve with flanged ends, bolted flanged yoke, outside screw rising stem, tapered solid wedge.

Fig. 1793 — Large 125-pound Iron Body Bronze Mounted Gate Valve. Sizes 2" to 30", incl. Has outside screw rising stem, bolted flanged yoke and tapered solid wedge.

***The Complete Powell Line includes Globe, Angle, Gate, Check, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-Resisting metals and alloys.**

Ask your nearest Distributor—or write direct

The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

Dependable Industrial Coals for LOWER STEAM COSTS!

● These two trade-marked coals are being shipped to more and more industrial plants as they continue to prove their value as low-cost steam producers.

One of Southern's experienced fuel engineers will be glad to tell you how GRAHAM or BROWDER coal is quickly amortizing new plant investments in numerous locations. A positive way to find out about the money-saving characteristics of these coals is to test the one our engineers recommend in *your* plant.

STEADY PRODUCTION • TREMENDOUS RESERVES • IMMEDIATE SHIPMENT

GRAHAM COAL

A Thrifty Fuel Since 1903

● Specifically prepared for industrial or utility use GRAHAM Coal and BROWDER Coal deliver exceptional efficiency and daily economy. Produced in Western Kentucky by the most modern methods known to the industry... and ready to serve you every producing hour.

For a comprehensive picture of the entire Southern organization and a complete listing of the coals now being offered by Southern, write for specially prepared brochure. Sent promptly on request.

BROWDER COAL

● SPECIALIZED SERVICE from our staff of fuel engineers is available always. They can provide you with a technical service on industrial coals backed by 53 years experience in the coal business. On request, one will welcome the opportunity to counsel with you.

Write or Telephone Our Nearest Office

Southern Coal Company, Inc.

SOUTHERN COAL COMPANY INC.

General Office: 333 North Michigan Avenue, Chicago 1, Ill.

Offices in: ATLANTA, BIRMINGHAM, CHARLOTTE, CHICAGO, KNOXVILLE, LOUISVILLE, MEMPHIS, NASHVILLE, ST. LOUIS

Sinclair Coal Company, Kansas City 6, Mo.—Western Representatives

Boon-Strachan Coal Company, Ltd., Montreal—Canadian Representatives

(49-68)

Here's How to Erase Smoke Troubles

VIOLATION OF SMOKE ORDINANCE

LOSS OF FUEL ECONOMY

BAD COMMUNITY RELATIONS

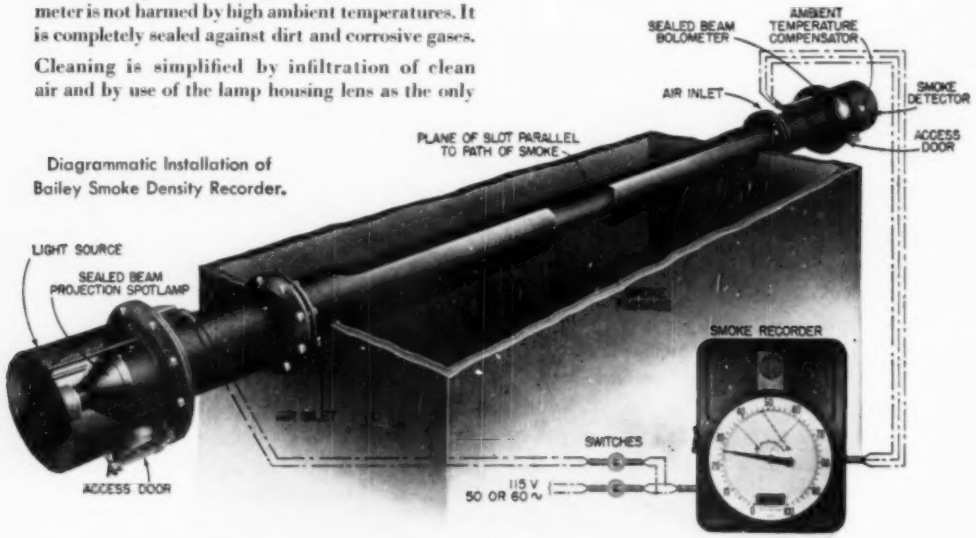
★ One of your first steps in erasing these troubles which result from excessive smoke, should be the installation of a Bailey Smoke Density Recorder. This 24-hour recorder is not an ordinary photo-cell instrument. Instead it detects smoke density by a Bolometer which is simply a sturdy tungsten filament and a parabolic mirror, mounted in a standard sealed beam automobile head lamp housing.

In using this simple, unique smoke detector, you do not have to provide cooling devices since the Bolometer is not harmed by high ambient temperatures. It is completely sealed against dirt and corrosive gases.

Cleaning is simplified by infiltration of clean air and by use of the lamp housing lens as the only window between the Bolometer and the gas passage.

It's easy to secure and maintain alignment of the sealed beam light source with the Bolometer since they are mounted at opposite ends of a slotted pipe which extends across the smoke passage.

For complete information on how you can profitably use this unique instrument to erase your smoke troubles, ask for Bulletin 211, "Bailey Smoke Density Recorder".



Diagrammatic Installation of Bailey Smoke Density Recorder.

G-29

BAILEY METER COMPANY

1028 IVANHOE ROAD, CLEVELAND 10, OHIO • BRANCH OFFICES IN PRINCIPAL CITIES

BAILEY METER COMPANY LIMITED, MONTREAL, CANADA

Let Bailey Smoke Density Recorders Watch Your Stacks

For a Bigger BOYS' TOWN

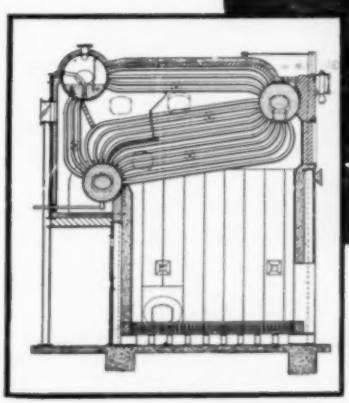
550 more deserving boys . . . meant more housing, more laundry, more heating, more food . . . all calling for much more steam at Father Flanagan's Boys' Town near Omaha, Nebraska. From a model new boiler plant, all steam required to accommodate 1,000 youthful citizens at work and play is being supplied by a battery of four Type H Stirling units. Selection of these boilers by such a famous charitable institution, where every operating dollar is a trust, indicates confidence in their outstanding ability to deliver dependable, clean, dry, low-cost steam for many years of trouble-free service.

Perhaps *your* steam requirements fall within the highly-efficient, economical range of the Type H Stirling Boiler. Find out why more than 2,000 units of this type are now serving industrial plants, smaller central stations, laundries, office buildings, institutions, hospitals, schools, and other industrial and non-industrial users. Write for Bulletin G-8-E. The Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.

"He ain't heavy, Father . . . he's m' brother"

4 new B&W boilers

Type H Stirling Boilers, each of 17,600 lb. per hour steam capacity, oil- and gas-fired.



BABCOCK & WILCOX

G-447

SAVE LABOR WITH GUN-PAKT

SINGLE END WELDING TYPE
with base 150 lbs. pressure

YARWAY

TOLEDO EDISON CHOOSES THE EXPANSION JOINT THAT IS *Serviced* UNDER FULL STEAM PRESSURE

Toledo Edison Company knows how to save on expansion joint maintenance. They use Yarway GUN-PAKT Joints—22 of them, ranging in size from 8" to 14" on their recent steam distribution extension.

GUN-PAKT Joints are serviced under full steam pressure . . . no costly shutdowns or heating interruptions. For repacking, simply insert a packing plug, twist a wrench, and the job's done! Special Alemite fittings provide for proper lubrication. Maintenance costs are low. One user says only 65 cents per year per joint. Others claim less than that. But wherever steam is distributed, and expansion joints are used, the trend is toward GUN-PAKT.

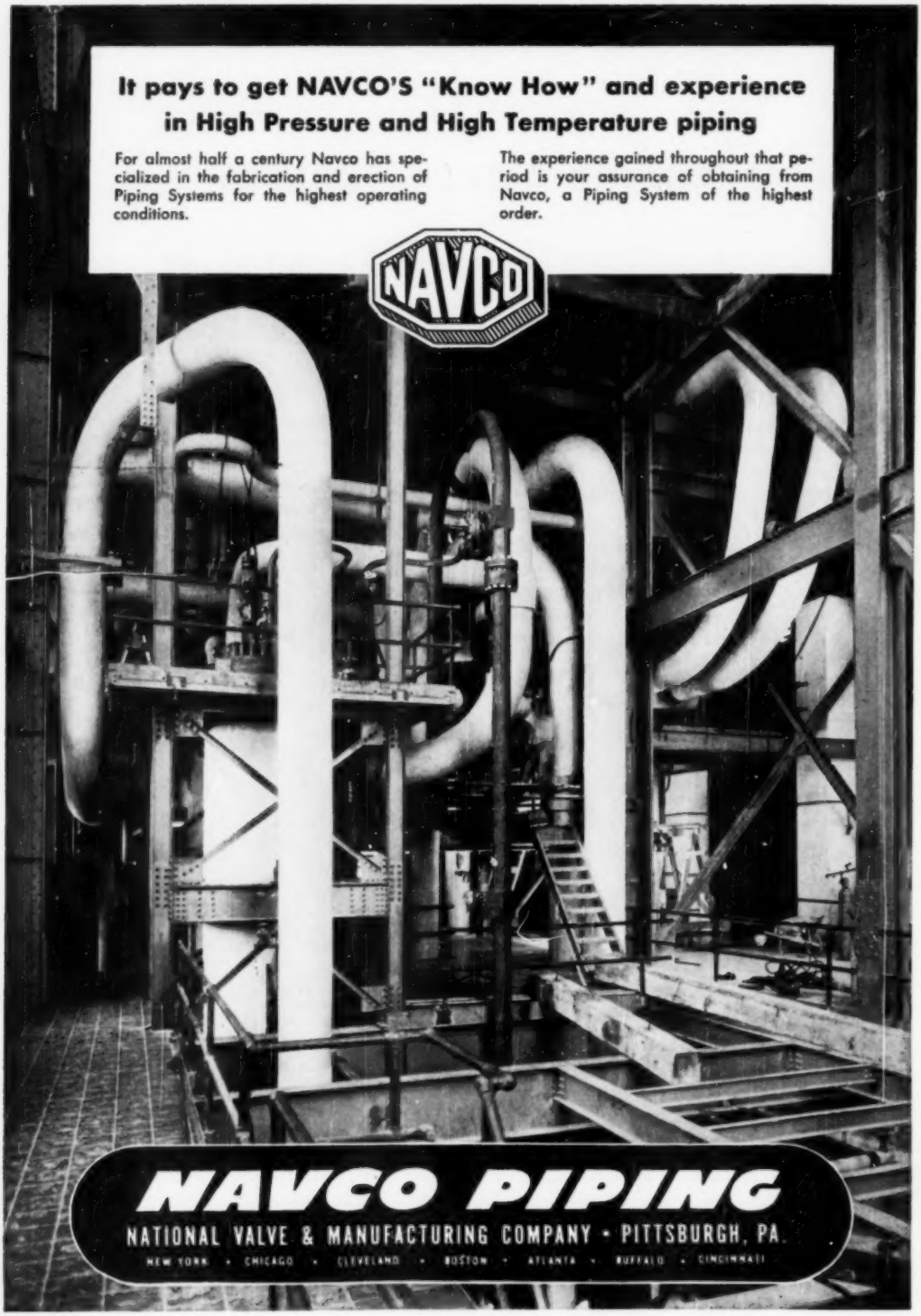
Read the GUN-PAKT story in Yarway's Bulletin EJ-1912. Write—

YARNALL-WARING COMPANY
Home Office: 116 Mermaid Ave., Philadelphia 18, Pa.
Southern Representative:
ROGER A. MARTIN, Bona Allen Building, Atlanta 3, Ga.

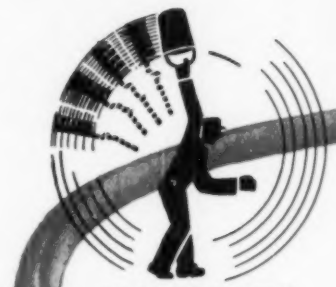
8" Gun-Pakt Joint on Toledo Edison line at Manhole No. 12.

Yarway Gun-Pakt Joint on Toledo Edison Jackson Avenue line.

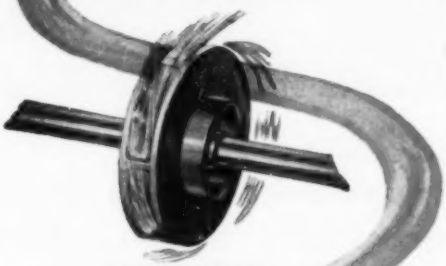
14" Gun-Pakt Joint in Toledo Edison No. 1 Manhole.


It pays to get NAVCO'S "Know How" and experience in High Pressure and High Temperature piping
For almost half a century Navco has specialized in the fabrication and erection of Piping Systems for the highest operating conditions.
The experience gained throughout that period is your assurance of obtaining from Navco, a Piping System of the highest order.
NAVCO
NAVCO PIPING
NATIONAL VALVE & MANUFACTURING COMPANY • PITTSBURGH, PA.
NEW YORK • CHICAGO • CLEVELAND • BOSTON • ATLANTA • BUFFALO • CINCINNATI

Let's get down to Pump *Fundamentals*



CENTRIFUGAL FORCE



PUMP IMPELLER

THE MODERN MOTORPUMP

EVER swing a small pail of water in a vertical circle? Never spilled a drop did you? Naturally, you know that centrifugal force kept the water in the pail by forcing it against the bottom of the pail. Had there been small holes in the bottom of the pail the water would have been forced through with considerable velocity.

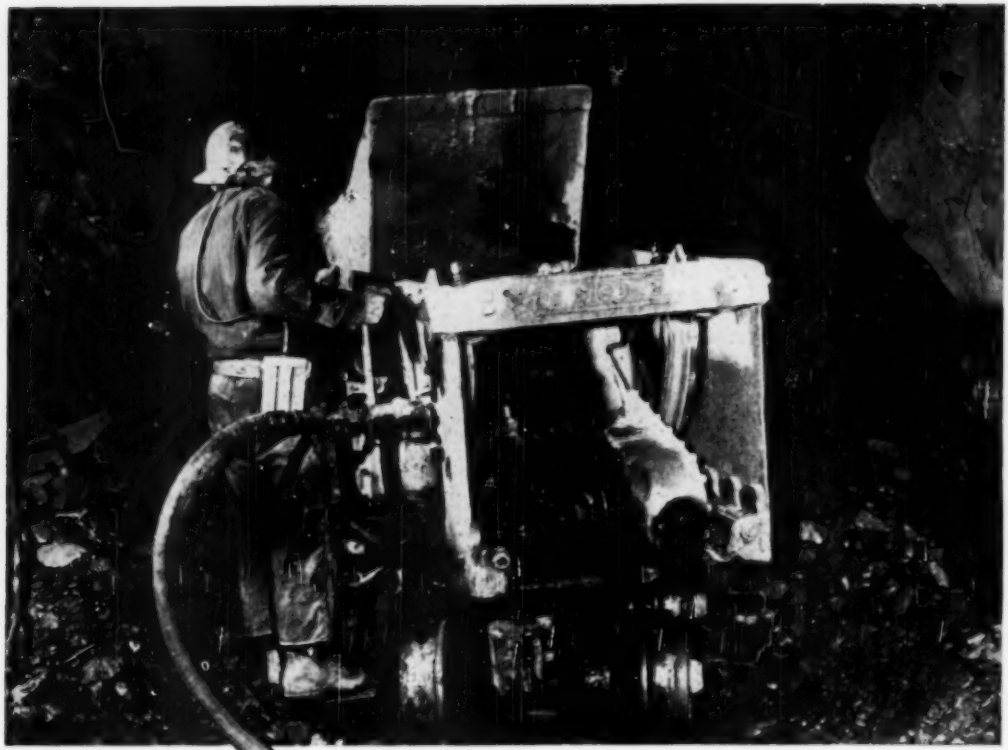
Basically a centrifugal pump uses this principle. Liquid enters the eye of the impeller and is forced by centrifugal action through small volutes which increase in size to the perimeter of the impeller developing pressure. This pressure is the moving force of the liquid.

The outstanding modern centrifugal pump is the Ingersoll-Rand MOTORPUMP. Its carefully designed and precision manufactured impeller and component pump parts gives top performance and reliability.

Look at the scope of just this one line of Ingersoll-Rand pumps, each a compact, self-contained unit with a built-in motor. From the many sizes and types of motorpumps you can select a unit from ¼ to 40 horsepower . . . 10 to 1800 gallons per minute - - - for heads to 600 feet . . . single and multi-stage. I-R Factory trained sales representatives across the nation will gladly help you with your present and future pumping problems. Prompt deliveries can be made from factory and branch stocks. Ask for catalogue No. 7093-A, which gives the complete story on Motorpumps.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 354-9



Republic Air Hose establishes preference for underground iron mine work

● One of the world's largest iron mines recently voted Republic Champion the best available air hose for use with underground power loaders. Selection was made after a series of tests proved it outperformed all other competing hose.

Republic Rubber and its Duluth Distributor, the MacAskill-Monaghan Company, recommended Champion Air Hose for this work because it is ruggedly built and withstands the most abusive operating conditions.

Champion is a flexible hose of great strength, having exceptional resistance to pulsating and high working pressures. Special high tensile cord encloses the oil-resistant Reprene tube and a thick, highly resilient, low gravity, tan cover protects the hose against abrasion and shock. Champion is also available with a yellow safety cover that makes it plainly visible even in underground operations.

Mr. W. K. MacAskill, President
MacAskill-Monaghan Company
Duluth, Minnesota

Republic Rubber makes 840 different types of hose for every need. Like Champion, each is designed to give longer service life per dollar invested.

Consult your nearby Republic Distributor today. He can help you select the very best hose for your particular need.

Remember, Republic Rubber has been *the* specialist in the mechanical rubber goods field for more than 48 years.

Pioneers in the use of COLD RUBBER

REPUBLIC RUBBER DIVISION
LEE RUBBER & TIRE CORPORATION, YOUNGSTOWN, OHIO
Lee Deluxe Tires & Tubes • • Conshohocken, Pa.

MECHANICAL RUBBER GOODS BY
REPUBLIC RUBBER DIVISION

The Accumulator operates to maintain constant boiler pressure while delivering steam at constant pressure to the process system despite widely fluctuating demands. Thus, in effect, the Accumulator functions as a "thermal flywheel".

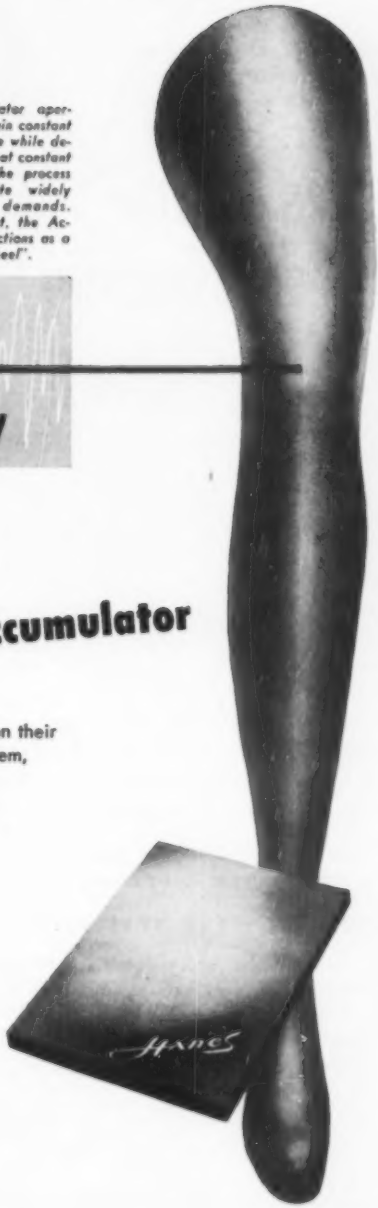
a balanced steam supply

problem of variable process steam demand solved at HANES HOSIERY MILLS with a

Foster Wheeler Ruths Accumulator

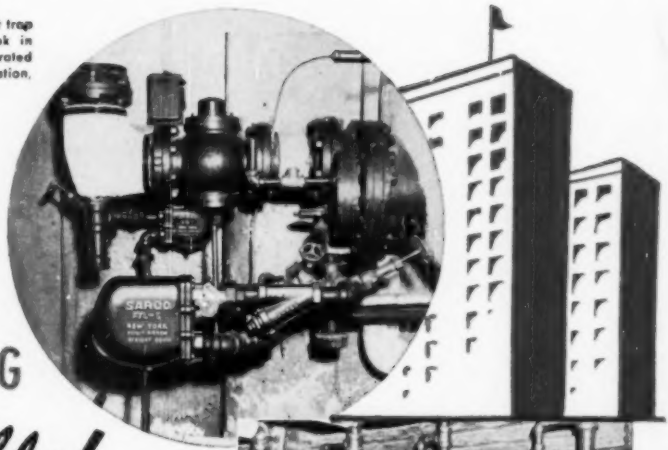
In order to smooth out uneven and intermittent demands on their steam generators, the Hanes Hosiery Mills at Winston-Salem, N. C. have installed a Foster Wheeler Ruths Accumulator which insures greater boiler room economy and permits full use of the company's preboarding operation, previously limited because of insufficient steam supply.

Nylon is a plastic and consequently must be set in preboarding machines with live steam to render it stable. In operating a large battery of preboarding machines the steam load fluctuates greatly—a heavy load one minute, no load the next. This fluctuating load is very hard on boilers unless there is much excess capacity. A Ruths Accumulator placed between the boilers and the preboarding machines levels out this load by meeting the fluctuating load of the preboarding machines while drawing a constant even load from the boilers.



FOSTER WHEELER CORPORATION
165 Broadway New York 6, New York

Sarco TR-21 control and Float trap on 1300 gallon storage tank in the Equitable Building, operated by The Real Estate Corporation, Chicago.



HOW SARCO KEEPS A BIG OFFICE BUILDING *Comfortable!*

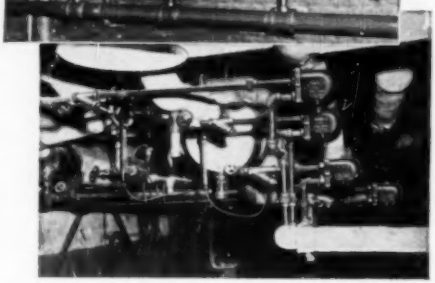
Few office workers realize what goes on below the street level in order that they may work in comfort and without interruption.

But the engineer can tell you that Sarco is the heart of the heating and air conditioning systems in this big building. In fact, he says he "wouldn't have anything else."

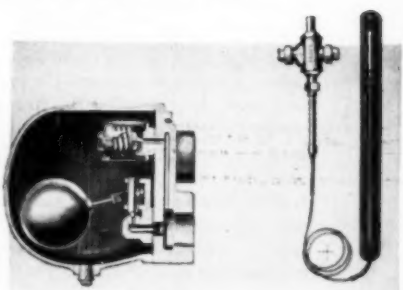
Hot water service, the source of many tenant complaints, is controlled to a degree with Sarco TR-21 regulators, float traps and strainers on primary and secondary tanks—including one for air conditioning. (See illustrations)

A bank of risers is dripped by Sarco float traps and of course Sarco radiator traps are found on every radiator.

Engineered primarily for service, such a system also results in minimum fuel consumption.



Bank of Sarco FTLO traps on risers and TR-21's on storage tank and heater



YOU CAN HAVE THIS SERVICE TOO . . .

It sounds simple, and yet hundreds of buildings are still handicapped by impossible heating hookups; noisy radiators, some areas too hot, others too cold, hot water complaints all day long, and a fuel bill that is 10 to 20% higher than it should be.

The Sarco Representative near you will look over your building without obligation. You will be surprised to see how much can be done and how little it will cost.

221

SARCO SAVES STEAM

SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

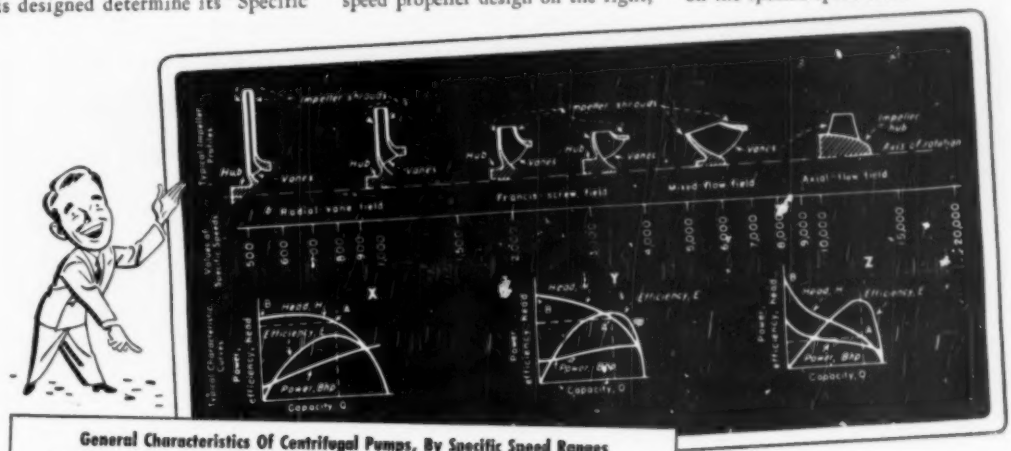
IMPROVES PRODUCT QUALITY AND OUTPUT

Pointers on Pumps

How Do Head, Capacity and Speed Affect Centrifugal Pump Design?

The head, capacity and speed for which a particular centrifugal pump is designed determine its "Specific Speed." Pumps having the same "Specific Speed" will have like proportions and characteristic curves.

The illustration shows several typical pump-impeller profiles, ranging from the low specific speed radial flow on the left to the high specific speed propeller design on the right, each design being placed in its proper position with relation to the specific speed scale. Below the scale, characteristic curves X, Y and Z indicate the hydraulic characteristics of three pumps, each designed for a specific speed corresponding to its position on the specific speed scale.



General Characteristics Of Centrifugal Pumps, By Specific Speed Ranges

Low Specific Speed — Diagram X

Small rise in head from point of maximum efficiency "A" to shut-off "B".

Wide capacity range at high efficiency.

Rapid decrease in bhp from point of efficiency "A" to shut-off "B".

Medium Specific Speed — Diagram Y

Steeper rise in head from "A" to "B".

Moderate capacity range at high efficiency.

Nearly constant bhp from "A" to "B".

High Specific Speed — Diagram Z

Very steep rise in head from "A" to "B".

Narrow capacity range at high efficiency.

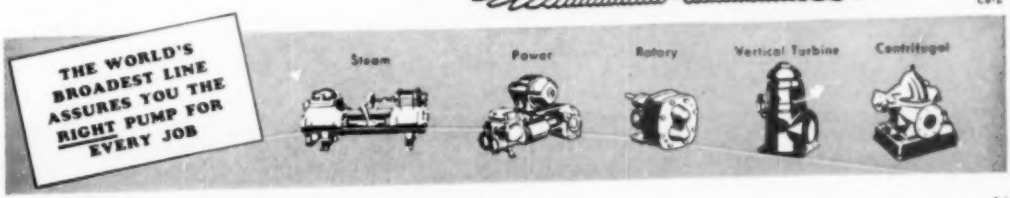
Rapid increase in bhp from "A" to "B".

These basic characteristics may be modified to obtain certain desirable features. For example, although boiler feed pumps have low specific speed, they require a steadily rising head-capacity curve — not one that droops toward shut-off, as shown. There can be any number of pump designs in-between and beyond the few typical ones illustrated here.

You'll Find the Right Pump in the Worthington line — the world's most complete. Another reason why *there's more worth in Worthington* is the expert technical advice, backed by over 100 years of experience, that is always available to you. Just contact your nearest District Office, or write to *Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, New Jersey.*

WORTHINGTON

co-2



Specify Continental SCREW CONVEYORS

HELICOID *and* SECTIONAL

STANDARD *and* HEAVY

Everything in SCREW CONVEYORS

Fig. 4008 — Assembled Helicoid Conveyor

Fig. 4010 — Assembled Sectional Flight Conveyor

Fig. 4019 — Typical Helicoid Ribbon Conveyor

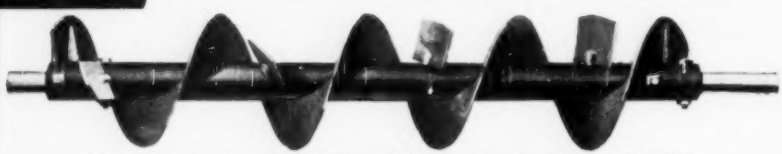


Fig. 4049 — Conveyor with mixing paddles — Helicoid or Sectional Flight

Fig. 4048 — Double Flight Helicoid or Sectional Conveyor

Fig. 4015 — Continuous Flight Cast Iron Conveyor

Fig. 4050 — Cut flight conveyor. Can be furnished in Helicoid or Sectional Flight.

Fig. 4202 Screw Elevator

Fig. 4131 — Special Conveyor on Oversized Pipe

Co. 5001

Industrial Division **CONTINENTAL GIN COMPANY** Birmingham, Alabama

RESTRICTED INNER VALVE PROCEDURE FOR FISHER DIAPHRAGM CONTROL VALVES . . . . . .

The introduction of Fisher's new restricted inner valves offers a quick, economical and completely satisfactory way to reduce the effective capacity of a larger nominal valve size.

INTERCHANGEABLE

FULL SIZE

1 SIZE SMALLER

2 SIZES SMALLER

PRACTICAL

For example, a 4" valve can quickly be converted to flow capacity of a 3", 2½", or 2" size. This is accomplished by the restricted V-Port Inner Valve alone—without changing seat rings. Inner valves with equivalent smaller size valve area or capacity are fully interchangeable with standard full size inner valves. Inner valve skirts are cast stainless steel with wide range percentage characteristics port areas. Cast skirts are welded on to stainless steel bar stock center post guide. Further details and application data gladly furnished on request.

FISHER GOVERNOR COMPANY MARSHALLTOWN, IOWA

Take a WALWORTH No. 225P Bronze Valve Apart...

COMPARE IT PIECE BY PIECE

It will pay you to look inside the Walworth No. 225P. Compare the improved design, construction and convenience features shown in the "exploded" view. Notice the husky bronze body, the removable seat and disc, the oversize stem, all assuring maximum protection against wear and leakage.

Further, No. 225P is the TOUGHEST bronze valve your money can buy. The stainless steel, noncorrosive seats and discs are heat treated to a hardness of 500 Brinell – hard enough to scratch glass and crush nails. For this reason, the valve can be closed on sand, slag, scale and similar flotage without injury to the seating surfaces, and "wire drawing" is practically eliminated. Thus years of tight, positive shut-off are assured.

Available in both globe and angle types (angle type: No. 227P) in sizes ¼" to 2", this quality valve is recommended for 350 lbs. W.S.P. at 550 F, and 1000 lbs. non-shock service on cold water, oil, gas or air.

For full data on this long-life, economical Walworth Bronze Valve, see your local Walworth distributor, or write for Circular 82.

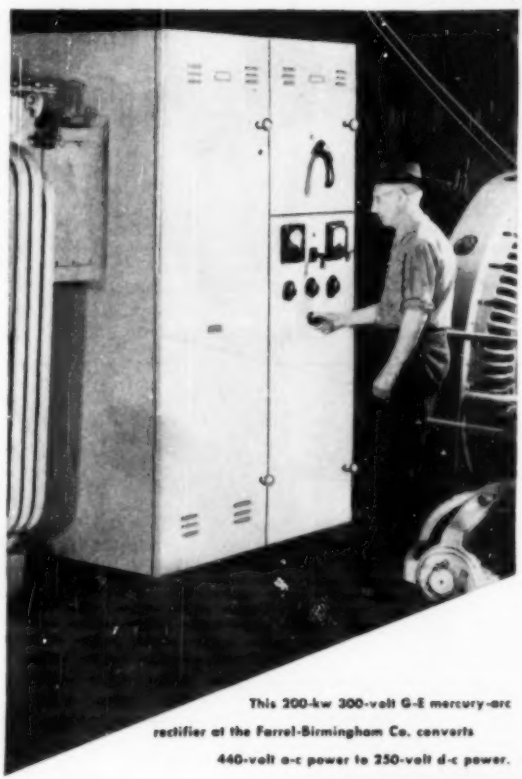
WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

"Best Answer to our D-C Power Conversion Requirements"



This 200-kw 300-volt G-E mercury-arc rectifier at the Farrel-Birmingham Co. converts 440-volt a-c power to 250-volt d-c power.

—says John W. Lenihan, Chief Electrical Engineer, Farrel-Birmingham, Inc., after installing

G-E MERCURY-ARC RECTIFIERS

The Farrel-Birmingham Co., Derby, Conn., is just one of the many forward-looking plants that is cutting power bills with the new, modern way to get low-cost d-c power—by installing mercury-arc rectifiers.

"Since the rectifier was installed in 1948," says one of the company officials, "it has required no major maintenance and no tube replacements. There are no rotating parts to clean and lubricate . . . no bearings or brushes to check. The rectifier eliminates all the maintenance headaches which normally accompany using other types of equipment for getting d-c power."

Other users report savings as high as 20 per cent in d-c power costs.

To Cut Your Power Costs

Find out today how you can cut your power bills by putting G-E mercury-arc rectifiers to work in your plant. They're easy to install and economical to operate. Call or write your nearest G-E sales office for information. Apparatus Department, General Electric Co., Schenectady, N. Y.

G-E MERCURY-ARC RECTIFIERS MEAN LOW-COST D-C POWER

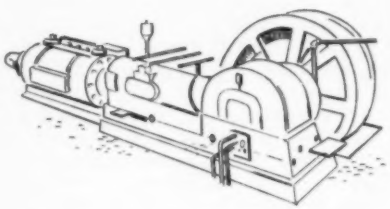
GENERAL ELECTRIC

WHAT SHOULD YOU EXPECT FROM

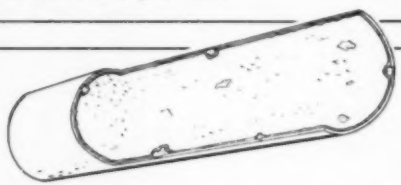
Boiler Water Conditioning?

As a boiler plant operator, you have a right to expect that boiler water conditioning will help you in four ways—to keep boilers clean, to provide pure steam, to minimize corrosion, and to reduce the chances of embrittlement. *These four objectives are written into your Hall contract.*

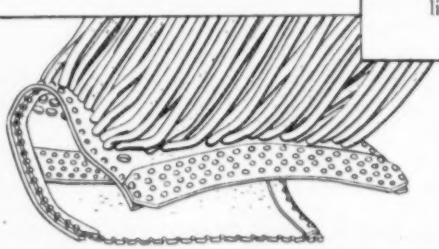
In modern boiler water treatment, chemicals transform scale-forming materials into free-flowing sludge, easily removed in blow-down, thus preventing scale on tube walls. Hall Laboratories discovered how scale really is formed, then how best to prevent it.



Impure steam may be anything from a nuisance to a disaster. Hall service helps you make sure that steam has the purity required for its uses in your plant.



Wherever water is in contact with iron, there is danger of corrosion. Many factors contribute to corrosion, but Hall service will help you to establish conditions which control corrosion.



When boiler metal becomes embrittled, spectacular damage can follow. It isn't common, but it can happen. Hall service helps you avoid conditions which are favorable to embrittlement.

Hall Laboratories serves plants of all sizes, from those which generate less than 1,000 lb./hr. of steam, to those which generate well over 1,000,000 lb./hr. They all find that they can profitably use Hall service.

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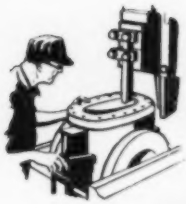
(A Subsidiary of Hagan Corporation)

Hagan Building, Pittsburgh 30, Pa.

CONSULTANTS ON INDUSTRIAL WATER TREATMENT
HALL SYSTEM OF BOILER WATER CONDITIONING
INDUSTRIAL WASTE RECOVERY AND DISPOSAL



A DISTINCTIVE FEATURE IN DISC GUIDING

Body guides are machined down to precision tolerances, assuring a perfect guide for the disc and creating a positive center line on which all subsequent machining operations are based.

BODY PRECISION MACHINED TO INSURE PERFECT FIT OF SEAT RINGS

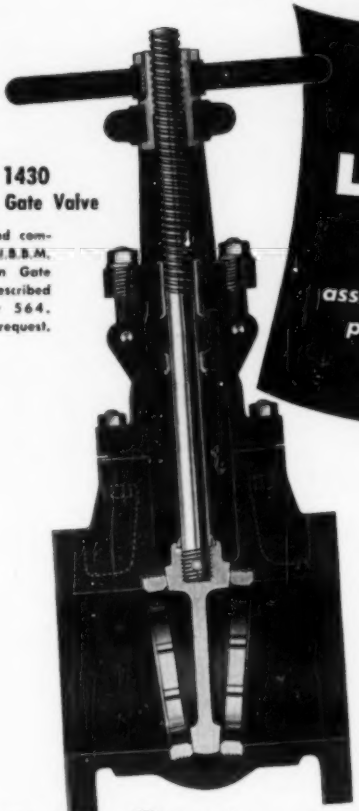
This operation makes inserting the seat rings in a Lunkenheimer gate valve simply a matter of screwing them into position. Parts can be replaced without any machine work or special fitting.

Precision Made LUNKENHEIMER VALVES....

assure perfect-fitting, interchangeable parts . . . longer valve life . . . easier, lower-cost maintenance!

Fig. 1430
Iron Body Gate Valve

Fig. 1430 and complete line of I.B.B.M. and All Iron Gate Valves are described in Circular 564. Mailed upon request.



THE smooth working efficiency and low maintenance cost of Lunkenheimer Valves were not "made in a day." Behind this superior performance and economy lies long experience, top engineering and metallurgical facilities together with the most modern manufacturing equipment.

Lunkenheimer Valves have a streamlined simplicity of design . . . a minimum of working parts, each part of extra strength, correctly proportioned and perfectly balanced. This assures longer life with lower maintenance expense.

Depend on your* LUNKENHEIMER DISTRIBUTOR *for service and reduced valve inventory!

Many concerns, large and small, have found real savings by depending on the complete stocks of Lunkenheimer Distributors. Capital formerly tied up in slow-moving inventory is available for other uses; losses from obsolescence are eliminated or drastically reduced. Ask your Distributor how he can help you.

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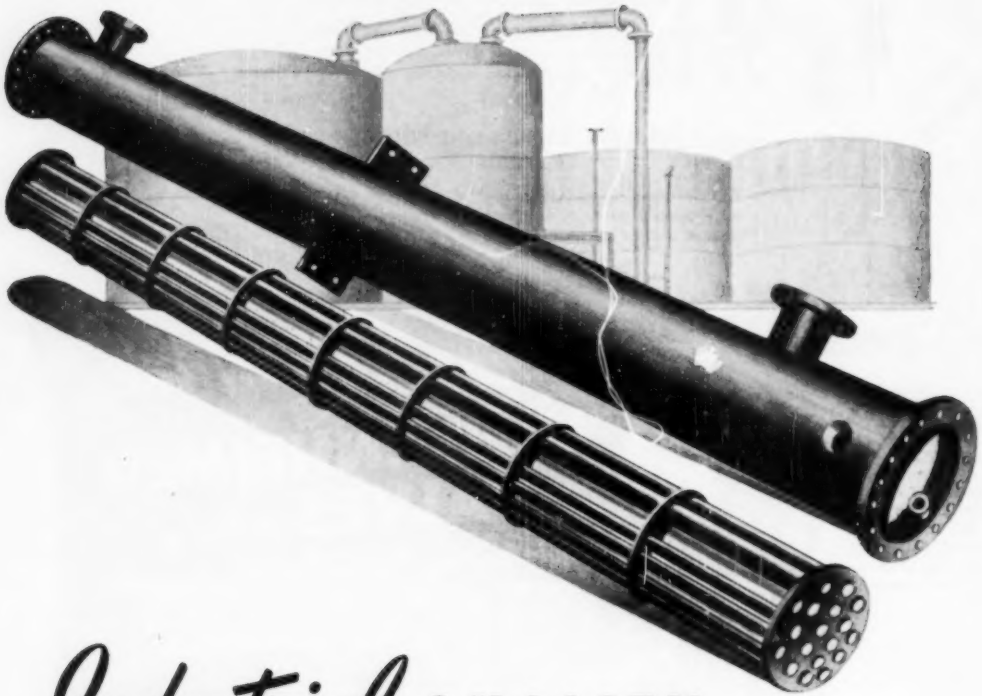

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Highly fabricated tanks and piping as well as simply designed vessels are produced to your complete satisfaction when you utilize the steel experts of our experienced organization.

If you are planning to expand or replace your present storage or materials handling facilities, consider the quality of Southland Steel Products.

Write us outlining your requirements. Our engineering staff welcomes the opportunity of working with you.

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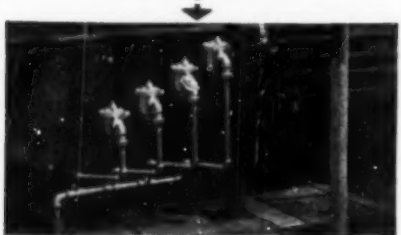
Chattanooga, Tenn.

OVER 40 YEARS OF SERVICE STEEL SOUTHLAND PRODUCTS TO AMERICAN INDUSTRY

"This Trap can't leak steam . . ."

YOU SAVE MONEY

$300 PER MONTH fuel saving with 17 Armstrong traps on jacketed kettles and expeller tempering troughs. The traps cost $316. More than 1000% return per year! — *Pacific Nut Oil Co., Los Angeles.*



20% FUEL SAVING since installing 57 Armstrong traps on heating coils makes the coal pile last longer at *Norton Greenhouse St. Paul.* Heating-up time has been cut in half, too.

THERE is never any loss of steam through an Armstrong Trap in proper working order, even when there is no condensate load . . . because steam never reaches the discharge orifice. The valve is water-sealed at all times. Entering steam is trapped in the inverted bucket, which then floats and closes the valve.

RESULT: You save steam, fuel and money, minimize back pressure in your return lines.

Your nearby Armstrong representative will be glad to quote on the traps you need now.

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SEND FOR the Armstrong Steam Trap Book. It describes operation of the Armstrong Steam Trap, contains prices, data, capacity chart, trap selection data for all classes of equipment.

ARMSTRONG STEAM TRAPS

NEED A *Reciprocating Pump?*

Let WARREN put a dependable, high performer on the job . . .

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Horizontal and Vertical single piston
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Satisfaction guaranteed . . . by one of the country's largest *exclusive* pumpmakers, by long and specialized application engineering, by craftsmanship from conscientious workmen.

Warren speaks your language. Tell us of your problem and get a good, sound recommendation.

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Capacities: 5 to 50,000 G. P. M.
Types: Horizontal and Vertical
Impellers: Open or enclosed
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P-19

WARREN STEAM PUMP COMPANY, INC. SERVICE EVERYWHERE **WARREN, MASS.**

WARREN PUMPS

CENTRIFUGAL AND RECIPROCATING

How Alchlor Process "Remove-ability"* gives Gulfcrest Oil its greater stability

In Cylinder 1 you see the oil that will become Gulfcrest. It has gone through the usual steps used in refining most other turbine oils—but has not yet been Alchlor-processed — an extra refining step that makes it extra pure and extra efficient.

*In Cylinder 2 you see the part—as much as 15%—which is discarded by the Alchlor Process. This is the part that, in ordinary turbine oils, is most likely to oxidize, increase neutralization number, and form sludge, emulsifiers, and acids.

In Cylinder 3 you see the finished Gulfcrest—the incomparably pure lubricating oil that gives outstanding performance and helps you keep steam turbine systems clean indefinitely. To make it even finer, special inhibitors are added to it.

Call in a Gulf Lubrication Engineer today and ask him to recommend the proper grade of Gulfcrest Oil to meet the specific requirements of your turbines. Write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company

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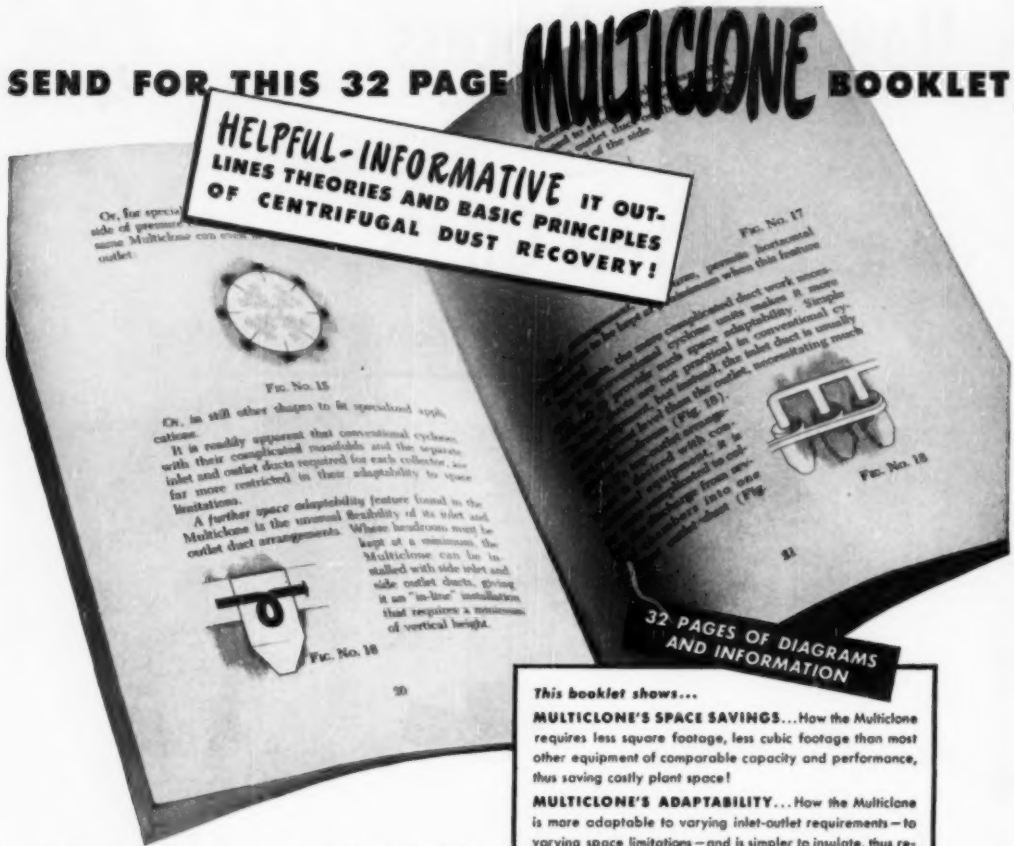
GULF INDUSTRIAL LUBRICATION

SEND FOR THIS 32 PAGE MULTICLONE BOOKLET

HELPFUL-INFORMATIVE IT OUTLINES THEORIES AND BASIC PRINCIPLES OF CENTRIFUGAL DUST RECOVERY!



NO MATTER whether you are now using mechanical dust recovery equipment or are planning the installation of such equipment at some future date, here is a booklet that is full of helpful and valuable information on centrifugal dust recovery. It not only explains the basic methods and principles involved, but also shows the important differences between small and large diameter separating tubes, shows how to simplify your duct work and reduce installation costs, and outlines many other important factors to be considered in selecting mechanical dust recovery equipment.

In addition, this informative booklet illustrates and explains how MULTICLONE'S unique *vane* design is fundamentally different...how it makes possible greater compactness, simpler installation, high recovery of the small particles as well as the medium and coarser ones, and many other facts on MULTICLONE advanced design.

A limited supply of these booklets is available for free distribution to those interested in mechanical recovery equipment and methods. Write for your copy today.

This booklet shows...

MULTICLONE'S SPACE SAVINGS...How the Multiclone requires less square footage, less cubic footage than most other equipment of comparable capacity and performance, thus saving costly plant space!

MULTICLONE'S ADAPTABILITY...How the Multiclone is more adaptable to varying inlet-outlet requirements—to varying space limitations—and is simpler to insulate, thus reducing installation costs!

MULTICLONE'S EFFICIENCY...How Multiclone's multiple *small diameter* tubes, made possible by its exclusive vane design, give higher centrifugal forces and more complete cleansing of *all* suspended particles—even small ones of 10 microns and less!

MULTICLONE'S LOW MAINTENANCE...How the Multiclone has no high speed moving parts to repair or replace, no pads or filters to clean or renew, nothing to choke gas flow or increase draft losses as suspended materials are recovered. Multiclone draft losses remain uniformly low—recovery efficiencies uniformly high—at all times!

Make sure that a copy of this helpful booklet is in your reference files by sending for your copy now!

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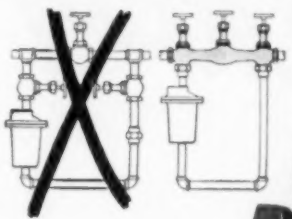
In power or process piping, you'll

SAVE

money
space
maintenance
weight
time

WITH THE

HONEYWELL BYPASS



Outmoded set-up at left uses 18 threaded joints . . . Honeywell Bypass uses only eight.

THE Honeywell Bypass is a completely assembled and ready-to-use unit . . . compact and convenient. It eliminates from eight to fourteen threaded joints . . . with the usual leakage and maintenance . . . and affords continuous, trouble-free operation.

Yet it costs no more than the assortment of valves, nipples, fittings, unions and pipes (plus the cutting, threading and assembling) that you may be using now. The Honeywell Bypass is available in Bronze, Iron and Steel . . . for pressures up to 300 lbs. . . . with screwed or flanged ends.

Call in your local Honeywell engineer for detailed information on this bypass and such other Honeywell products as: Hi-Lift Hand Control Valves, Transfer Valves, Low Lift Diaphragm Control Valves, Liquid Level Devices and Steam-Jacketed Rotary Cocks.

WORLD'S LARGEST ORGANIZATION FOR ADVANCED INSTRUMENTATION AND CONTROL

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MINNEAPOLIS-HONEYWELL REGULATOR CO.
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Philadelphia 44, Pa.
Offices in 73 principal cities of the United States, Canada and throughout the world

Honeywell — Process Control Specialties — Belfield

A STACK THAT REALLY IMPROVES YOUR BOILER *Efficiency*

The Stack, fan and breeching are each only a *part* of an induced draft system. Separately built, they do not always provide the coordinated effort necessary for the most efficient draft that is possible.

Prat-Daniel Fan Stacks, however, offer an integrated induced draft system, combining the three elements of stack, breeching and I.D. fan, into one complete induced draft unit, each component designed to work with the other to produce the highest efficiency.

Prat-Daniel Fan Stacks are built to give your boiler a predetermined draft without excessive "safety factors" necessary with un-coordinated systems. They are completely fabricated and guaranteed by one responsible company . . . a company that has been designing and manufacturing draft-producing equipment for over a quarter of a century.

Write for the Prat-Daniel catalog on Fan Stacks.

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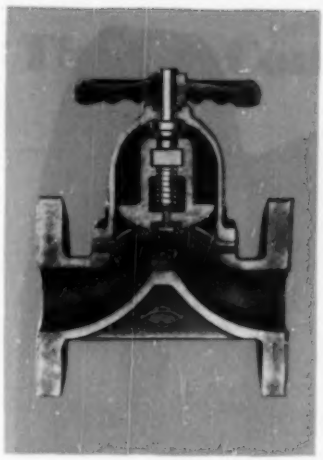
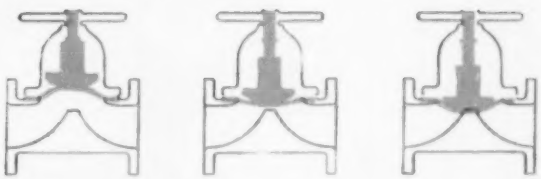
DESIGNERS AND MANUFACTURERS OF POWER PLANT EQUIPMENT FOR OVER 25 YEARS

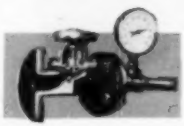


If you need a diaphragm valve you need all the advantages of diaphragm closing



Check these popular features of

GRINNELL-SAUNDERS DIAPHRAGM VALVES



Diaphragm gives leak-tight closure against grit, scale, solid matter . . . Even when something as substantial as an 8-penny nail is trapped on the weir of a rubber lined valve, as illustrated, the resilient diaphragm, plus the large area of contact, gives leak-tight closure against pressure or vacuum.

Diaphragm lifts high for streamlined flow in either direction . . . Smooth, streamlined passage, without pockets, prevents trapping of sludge and reduces frictional resistance to a minimum—irrespective of direction of fluid flow. No disc holder in fluid stream. Grinnell-Saunders Diaphragm Valves are self-draining when installed with the spindle at 15 degrees above the horizontal position.

Diaphragm absolutely isolates working parts from fluid . . . There's no "if" about the way a continuous, one-piece diaphragm seals off the working parts from fluids; no perforation or puncture in the diaphragm where fluid or gas can possibly leak by the valve spindle. No sticking, clogging or corroding of working parts. Valve lubricant cannot contaminate the fluid in the line.

Diaphragm, body and lining materials to meet particular conditions . . . Bodies stocked in cast iron, malleable iron, stainless steel, bronze and aluminum: other materials on special orders. Valve bodies lined with lead, glass, natural rubber or neoprene. Diaphragm materials of natural rubber or synthetics. Working pressure, 150 lbs.; maximum temperature, 180°F.

Diaphragm is only part that normally wears and needs replacement . . . Depending on the type of service, it may last for years, particularly since the compressor and finger plate combine to support the diaphragm in all positions. The diaphragm can be replaced quickly without removing valve from line. No refacing or reseating. No disc holder to require tightening or replacing. No packing glands to demand attention.

Write today for the new Grinnell-Saunders Diaphragm Valve Catalog 4-S.

GRINNELL

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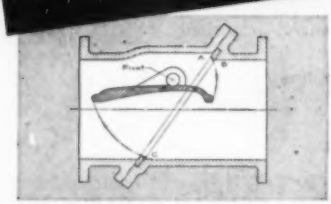
SAVE UP TO 80% IN HEAD LOSSES

with CHAPMAN TILTING-DISC CHECK VALVES

That's right! With Chapman Tilting-Disc Valves, head losses are 65% to 80% lower than for conventional type check valves.

But no wonder head losses are lower. Chapman Check Valves work with . . . not against . . . the stream. The balanced disc rides smoothly on the flow . . . lifts away easily in opening and closes quickly and quietly. There's no slamming to cause destructive pipe line stresses . . . minimum wear on seats, hinge pins and bearings.

All these features mean lower maintenance costs for you. So write *today* for additional information.



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

The Chapman Valve Mfg. Co.
INDIAN ORCHARD, MASSACHUSETTS

Timely Comments

Industrial Management Achievement

THE 1949 GANTT MEDAL for "distinguished achievement in industrial management as a service to the community" was awarded November 30th to **Arthur Clinton Spurr**, president of the **Monongahela Power Company**, of Fairmont, West Virginia, at the 70th annual meeting of The American Society of Mechanical Engineers in New York City. The award was made to Mr. Spurr "in recognition of leadership in welding the industrial, agricultural, and human resources of his community into a cohesive and dynamic force that has revitalized and rehabilitated the social and economic life of the entire area to which his influence extends."

The award was established in 1929 in honor of the late Henry Laurence Gantt, management engineer and industrial leader. It is awarded annually by a board composed of representatives of the ASME and the American Management Association.

Shortly after having become head of the Monongahela Power Company 15 years ago, Mr. Spurr is credited with having initiated and to this day led a program of rehabilitation in the Upper Monongahela Valley in answer to a challenge which he considered was contained in a report of the United States Department of the Interior.

The 1934 report, on the ten county area of the valley, found 92 communities permanently or temporarily "stranded" and suggested that private interest "be invited to make this region a yardstick to measure the ability of private capital to benefit the communities within an area, socially as well as industrially."

Impressive Economic Gains

The report concluded, however, that "past experience has shown that the forces of private utilities' development have shown little disposition to work for the general good of the people living in this region." Listed by the report as deficiencies in the area were: the farm income (the lowest cash farm income of any state in the union), land and farm tax deliquencies, number of families on relief, percentage engaged in industry and mining, average retail sales per inhabitant compared to the national average, lack of reforestation and the number of manufacturing wage earners.

Impressive economic gains in the area were recorded as a result of a corrective program initiated by Mr. Spurr. The benefits were achieved through such agencies as the Territorial Development Department of the Monongahela Power Company, created in 1936, coal bureaus, agricultural agencies and regional groups such as the Upper Monongahela Valley Association and the Little Kanawha Regional Council formed in the Central Ohio Valley region, also a part of Monongahela territory. Mr. Spurr is acknowledged as the guiding spirit of a majority of these groups.

Just Good Business

In initiating his program, Mr. Spurr explained his purpose thus: "To accomplish our objectives we must have the friendly cooperation of the public with whom we live. We must convince them of the honesty of our motives, and there can be no question of honest motives if we are working for the community and demonstrate a sincere desire to help the community and demonstrate a sincere desire to help the community grow and prosper.

"Ours is not a philanthropic or altruistic move nor a public relations stunt, but just plain good business. Perhaps it could be called 'enlightened selfishness.' We're frank about our policy and our frankness hasn't hurt us. We admit we're in community development and territorial development to make money. We can't make money unless the people we are serving make money. No program should be undertaken unless its expense can be justified by the nature of the business in which the company is engaged.

"The Company's sake in territorial development is the share it gets from increased prosperity for the people in its area. A heavy investment in plants and power lines make it sound business for a power company to protect that investment by aiding the economic well-being of its customers."

SPECIFY ERNST WATER COLUMNS AND GAGES FOR ALL PRESSURES AND TEMPERATURES

Fig. 5

Standard Vertical bronze water gage, 350 pound design, heavier construction up to 450 lbs. Stainless and forged steel for higher pressures.

Gages can be furnished with Automatic Ball Shut-off if required.

Fig. 8

All Iron gages for pressure up to 250 lbs., heavier construction up to 350 lbs.

Fig. 855 — Same gage made in stainless steel.

Fig. 72

For steam pressure above 500 pounds we recommend ERNST Flat Gage Glass Inserts with "Split-Gland" Gages. (Write for Bulletin Q).

INCLINED FOR BETTER VISIBILITY

Fig. 1

"Split-Gland water gage

NO GAGE GLASS PACKING NUTS

Simple and easy to insta a gage glass. No wrench or tools required. A to of the hand wheel co presses the packing.

made to fit any Column or Boiler

SIGHT FLOW INDICATORS
for insertion into pipelines

Fig. E-57
Bulls Eye Type

Fig. 17-28
Tubular Glass Type

Fig. E-811
Flapper Type

ERNST TRY COCKS
LEVER AND WEIGHTED TYPE FOR ALL TYPES OF BOILERS

Fig. 13

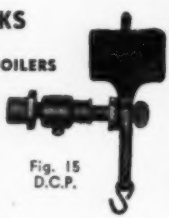


Fig. 15
D.C.P.

bronze, with wheel →

Fig. 01

Fig. AS-250 Bronze spring type.

Write Ernst

Fig. 10

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Fig. 55

Ernsthru Vision "Doubleunion" Overlapping Unit

Fig. 45

Single Vision type

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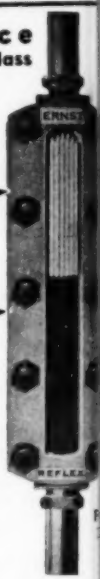
STEAM SHOWS **WHITE** →

WATER SHOWS **BLACK** →

Guard Against Accident with Ernst Plastic Safety Guards non-breakable

Fig. 31



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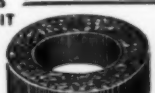

Fig. 22 STANDARD

Fig. 21 LIP MOLD

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Industry Speaks

Research Shows Results in South

H. McKINLEY CONWAY, Jr.
Director of
Southern Association of Science and Industry

Speaking before the Southern Governors' Conference at Biloxi, Miss., on Nov. 21, said in part.

DURING the past decade the South has developed another industrial resource which may soon equal in importance such well-publicized assets as its minerals, climate, and labor supply. The new Southern resource—organized scientific research—already is contributing substantially to Southern economy and, as industry grows more complex, will become increasingly vital.

The number of scientists active in the South has more than doubled during the 1940-50 period, and their output of technical data has been trebled. An outstanding example of these technological strides, is the remarkable growth of two industrial research institutes organized to conduct experiments for Southern business firms: One of these was founded in 1942, with a first year budget of $95,000. Through contracts with Southern industrial concerns and other agencies, this institute increased its research volume to $230,000 in 1944, to $310,000 in 1946, and to more than $600,000 in 1949. The other institute began in 1945 with a budget of $70,000 and by 1948 was conducting industrial research to the extent of $410,000 per year.

Prominent among the contributions of research to industry are specific developments in peanut utilization, wood utilization, cotton and cottonseed, petroleum and natural gas, essential oils, sugar and starches, textiles, and other fields.

The extensive and varied research under way in the South has made itself felt in many fields, but certainly results are most visible in the mushrooming chemical industry. Gigantic new plants are to be found throughout the region: alkali plants in Virginia and Louisiana; phosphoric acid and phosphate salt plants in Alabama and Tennessee; chemical fibre plants in Georgia, Tennessee, North Carolina, South Carolina and Virginia; a cellophane plant in Virginia; an aluminum ore processing unit in Alabama; pulp and paper mills in every Southern state; industrial alcohol units in several states; bleaching and dyeing additions at newer textile mills; rubber manufacturing facilities in Alabama; a glass-producing plant in Mississippi; a synthetic ammonia plant in Virginia; a plant to extract Bromine from sea water in Texas; a sulphuric acid plant in Virginia; Portland cement units in many states; a tin smelter to process imported Bolivian concentrates in Texas, and a great many others too numerous to mention.

A decade ago, scientific articles by Southerners were rarely seen in recognized technical journals. During recent years, however, Southern scientists have contributed an increasingly large number of valuable reports to the technical literature of the nation, and in 1949 there was launched the *Journal of Southern Research*, the first publication of its type to be issued in the South. This periodical, which serves as the official publication of the SASI, has been unable to accomodate the large amount of technical material offered, and during 1950 will be published monthly instead of quarterly to provide an outlet for more Southern research findings.

One of the most encouraging aspects of this research progress is the fact that the South's more talented young men can now obtain advanced technical training in Southern universities and then find employment in Southern research laboratories. This means that the South at last is beginning to keep its best talent at home to study and develop local resources. It means that the South is harnessing its scientific brains to its industrial sinews.

The Southern Association of Science and Industry, a non-profit regional research association, is the largest such organization devoted to Southern development. Founded in 1941, it has worked constantly to study and develop the resources of the region. A central office is maintained at 5009 Peachtree Road in Atlanta. Current President is Dr. Stewart J. Lloyd, Dean of the University of Alabama's School of Chemistry at University, Alabama.

The Human Element in Costs

and How to Reduce Labor Turnover

It costs about $200 to change from one worker to another. If your turnover should be 10 employees per month in an organization of 1,000, you have an investment, or a loss, of approximately $24,000. It takes a lot of manufacturing, sales, and service to overcome $24,000 unnecessarily spent.

By A. L. Bechtold

Personnel Director
Lance, Inc.
Charlotte, North Carolina

BECAUSE of the many factors which enter into the operation of business, whether it is a manufacturing concern or a service organization, business itself must also recognize the human element in the costs of the operation. This cost has been generally overlooked in the recent years because of the lack of competition. It was a matter of producing and getting goods and services to the customer. Whatever the additional cost, the human element was just another item and passed on to the consumer. But today the picture has changed. The item of cost in regard to the human element factor must be studied and analyzed thoroughly because of what it means to an organization.

Physical Assets

A great deal of time and money is spent on the physical assets of any business organization, such as: raw materials, location of the plant, and the buildings themselves. Business has done an outstanding job in this respect. It is said that for every employee that business has on its payroll, an average of $8,000 has been invested by someone or some group of individuals. So if you have 1,000 employed, you have a minimum of $800,000 invested to keep those people on the job. This investment in capital outlay must be protected and preserved for future growth of our country.

Now let's look at another figure which is quite important, and that is the question of labor turnover. During the war years it was nothing uncommon for labor turnover to go as high as five, six, and even ten per cent of the entire payroll per month. This was extremely high. Today, turnover is generally about two per cent per month. Such a low turnover is an indication of a sound employer-employee relationship.

To illustrate what it costs the average industry to fire and hire a new individual, let me quote from a recent survey made by the Merchants' and Manufacturers' Association of Los Angeles. This survey analysis showed an average of $191.65 as a total cost of a separation and procurement of individual employees. Further breakdown showed that smaller firms with 100 to 200 employees have a cost of around $100 or more, while some of the larger and higher skilled organizations showed a cost of over $500.

The averages for an individual's separation and procurement costs on some of the basic items are tabulated.

You may say: "But my organization is different. I don't have some of these hidden costs which you have told us about, and we don't do some of the things such as an exit interview, advertising for help, physical examinations, etc." Well probably you don't, but nevertheless, you may have some other hidden costs in your separation and procurement of a worker that might not have been mentioned.

There is one factor that every organization has when they replace an individual with a new worker and that is—the training time and the cost. This training time, of course, can and will vary according to the job, the intelligence, and previous experience of the individual you have hired, but the same survey made by the same organization shows that it takes considerable time to train and adjust workers to their new jobs.

The detailed cost chart shows that your training time can vary considerably depending on the type of job you have. As previously stated from the other chart, you will notice we have set a figure $89.45 for training time. We arrive at this low figure by a compilation of reports from a number of firms who have said their training time was under $100 for an unskilled worker.

Now what does this all mean? You cannot take the average payroll, plus general overhead expense, and arrive at a true picture

as far as your company is concerned. You must also look at something else which is intangible, which your company does, either directly or indirectly, to influence labor turnover, and make the human element cost go up or down in your organization. The human element cost is a vital factor in any organization. Looking at it from this point of view, the measurement of turnover is actually a measurement of a company's employment stability. Frequently a weakness of this kind results in high turnover of new and young employees.

The trouble so often lies in faulty management procedures. There is the need for giving greater attention to this problem. Each company's situation is different. The problems are individual. Influence and community experience, together with the need of individual approach to this situation, should be studied carefully and analyzed. Potentially every time an old and experienced employee leaves your service and a new individual is hired, you are, either directly or indirectly, investing approximately $200 of your company's money.

Solution

A great deal of time, money, and effort has been expended in providing and developing the physical assets of an organization. By the same token, how much time and money has been expended by your company in developing the human resources of your organization. I don't mean by that, providing of adequate rest rooms, or a cafeteria, insurance plan, etc. In fact, another survey has shown the average industrial employee now receives the equivalent of 18c per hour in intangible services—insurance and other benefits. There is something else, though, that I think everyone should keep in mind to help solve this problem.

The human element factor or the human cost factor in any organization can be tied to the sound employee-employer relationship. There is the answer to the reduction of cost in your organization. Now just what is the definition of a sound employer-employee relationship. I think it can be briefly summed up as "A complete understanding between the worker and his boss." We might add the term "morale". High morale in an organization keeps people happy and satisfied—keeps them on the job so they do not want to leave.

If we want high morale in our organization, there is only one way to obtain it, and that is to have a good organization as such and its management to be understanding. High morale does not exist simply because top management thinks it it does, nor can it be obtained or built by an executive order from a corner office. High morale can exist, though, if your work is well-

HERE IS WHAT IT COSTS THE AVERAGE INDUSTRY TO FIRE AND HIRE A NEW INDIVIDUAL. TABLE TO THE RIGHT SHOWS THE AVERAGES FOR AN INDIVIDUAL'S SEPARATION AND PROCUREMENT COSTS ON SOME OF THE BASIC ITEMS SURVEYED BY THE MERCHANTS' AND MANUFACTURERS' ASSOCIATION OF LOS ANGELES. AVERAGE TOTAL WAS $191.65. SMALLER FIRMS WITH 100 TO 200 EMPLOYEES HAVE A COST OF AROUND $100 OR MORE, WHILE SOME OF THE LARGER PLANTS EXCEED $500. THERE ARE ALSO OTHER HIDDEN COSTS. IT TAKES CONSIDERABLE TIME TO TRAIN AND ADJUST WORKERS TO THEIR JOBS. THE CHART BELOW SHOWS THAT YOUR TRAINING TIME CAN VARY CONSIDERABLY DEPENDING ON THE TYPE OF JOB.

AVERAGE SEPARATION AND PROCUREMENT COSTS

Estimated Cost of Separation Per Employee	
Production Lost	$28.90
Exit Interview	7.02
Paper Work	8.59
Estimated Cost for Procurement per New Worker	
Advertising	$ 4.88
Interviews, Physical Examinations	14.15
Testing, Placement	5.63
Paper Work	7.54
Training	89.45
Extra Spoilage	32.10
Extra Supervision	45.51

AVERAGE TRAINING TIME AND COST

	Number of Companies Reporting	Average Training Time (In Weeks)	Number of Companies Reporting	Average Cost of Training (In Dollars)
Shop and Maintenance				
Unskilled	26	2.36	26	$106.49
Semi-skilled	25	3.72	24	187.96
Skilled	24	6.75	23	381.20
Technical				
Routine	12	5.83	6	168.08
Design	11	11.00	6	731.82
Office				
Routine	29	4.07	27	169.26
Specialized	25	7.36	18	342.35
Supervision				
First Line	15	15.00	10	1213.68
Major	14	34.57	6	3397.23
Staff and Administration				
Minor	12	26.33	3	1548.40
Major	12	46.83	2	4980.00

planned, where it has a smooth orderly flow of production, where the spirit of fair dealing and fair play is found at all times by everyone up and down the line, and where the natural and spontaneous friendliness with everyone has become a fixed custom.

In my estimation, there are seven major factors in helping to make a sound program for high morale—to build complete understanding between the worker and his boss.

Management Line

If top management does not set up a complete line of organization whereby each man, as well as each foreman, supervisor, knows this line, then you cannot expect complete harmony as far as the worker and his boss is concerned. Every individual, regardless of his position with the company, must be told of his responsibilities, together with the line of authority and to whom he must report for instructions at different times.

It is also management's responsibility for a good, sound human relation, to have properly trained foremen and supervisors, with a thorough knowledge of men and how to handle them. A worker soon learns when either his foreman, supervisor, or even department head, does not know what the score is—does not know how to deal with individual problems—does not know how to analyze the feelings of individuals. So if you want to cut the costs of operation, your organization should have a management line that is sound and is known to everyone.

Informed People

In developing high morale, you must have informed people, because it has been said that informed people are happy people. It is top management's responsibility to inform the individuals working for them, whether it is one, a hundred, or a thousand, of the many things which affect the company and the individual in particular. An individual working on the assembly line or a stenographer typing in an office is quite concerned in changes and what happens to the company which affects them.

By this I mean that they like to know what is going on in regard to the installation of new equipment, machinery, change of location of plant or office, or any other technological changes. They would like to know because they feel that they are part of the company.

Give Credit

Give credit for a job well done. This factor is probably overlooked more by many organizations than any other because business and industry seem to take for granted that when a person is doing a good job, he knows it. Department heads and officials are frequently prone to call an individual on the carpet, so to speak, when he makes a mistake or does something wrong. Now isn't it just as logical when a man, or a woman, does an outstanding job, that someone in authority take time out to compliment this individual and give him a pat on the back. A little pat on the back will automatically stir folks to greater heights and build an enthusiasm in the individual so that he will set his goal even higher than before. Such encouragement to the individual will not only accomplish better relationship, but will in turn develop quality production more efficiently, because the individual is taking more interest in his work. Caution must be exercised that this type of action does not fall too frequently on the same individual and give him "big head". He will also suffer from his coworkers if it is done.

Sense of Security

Why should security play such an important part in the elimination of labor turnover? It is easy to see that the majority of the individuals working today, whether a stenographer, a clerk, or a man on the assembly line, feel a direct responsibility to himself and to his family unit. So he places security above many things.

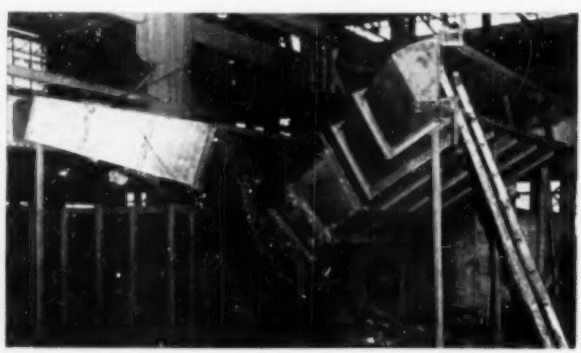
An individual working today has an ultimate goal, whether that be for his family or providing for himself. So why not, in one form

Chattanooga Plant Fabricates Huge Air Ducts

Although hot air ducts are a minor item in the manufacture of large steam generating units, they involve large amounts of material and require considerable floor space for the shop assembly required to insure proper fit in the field.

This view shows half of a complete section assembled in the shops of Combustion Engineering—Superheater, at Chattanooga, Tenn. Four complete sections or eight such units will be required for the two 670,000 lb C-E steam generating units now being installed in the Dunkirk Steam Electric Station of the Buffalo-Niagara Electric Corporation.

Total weight of the four sections will be 75,000 lb. When installed in the field, the "knocked-down" section will be bolted together and then welded.



or another tell the individual, that barring circumstances beyond your control, if he does a good job and continues to render a good service, his job will be permanent. If he feels that his job is hanging by a very thin thread, at the whims and wherefores of some foreman or office man, he cannot give his all to that job, because he is constantly worried about whether he will lose it or not. If a definite policy is set up regarding his temporary status, or trial period, tell him so. Some organizations say six weeks, others two months, some even six months. After he has gone through the preliminary period, why not tell him that his job is permanent, again stating that barring circumstances beyond your control, and he will understand. I think if an employee knows what his status is you find him to be more satisfied and happier at work and in turn will produce more efficiently.

Advancement

With the educational institutions today rendering such a good service by training and giving people the necessary background and enthusiasm to move forward, business and industry should be cognizant of the fact that people do like to know about opportunities which they might have in the organization.

Community Responsibility

How does this play a part in the stabilization of your work force, and help eliminate turnover? There again, the individual's pride plays an important part. I think everyone likes to work for a company that is respected in the community and takes an active part in the different phases of its community life. They have friends working in other organizations which do take an active part in community life and help develop the city, the county, and the state. Employees like also to work for an organization that encourages them to exercise their rights as citizens by giving them time off to vote when necessary. What the company is thought of on the outside is dependent largely on what the employees think of it because they help create feeling and goodwill for an organization.

Figures have proven that the largest turnover of employees comes with those who have given less than six months' service to an organization. Since this is the case, it points out one important fact —that we must be sure to bring this new individual into his job, into the community life of an organization just as quickly as possible. In other words, if an organization has a careful, well-planned program of indoctrinating all new employees to the company, the turnover will be less.

Have you ever gone into a strange town, or a strange place, and didn't know anyone, and had to make friends for yourself? If the new employee is turned loose, so to speak, in an organization and doesn't know anything but the job which he is doing, and has not had the opportunity to meet the folks that he is working with, and the things that affect him directly, he feels like a complete stranger and could very easily become discouraged and dissatisfied. A new employee should also be given all the information in regard to hours, lunch periods, rest periods, company policies, and last, but not least, he should be told what and when he is going to be paid.

Those are some of the vital points, which, to my estimation, effect the things which can mean either high or low human costs in your organization. It behooves all of us in business and industry today to develop and have a more thorough understanding of the individuals working for us.

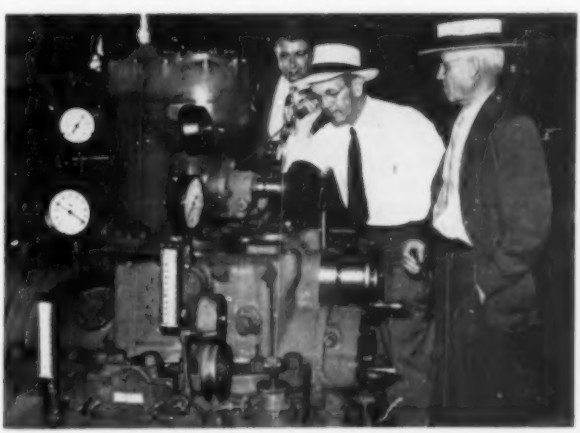
If you see that your house is in order in every respect, you will be able to cut your turnover from probably two per cent, to one-half of one per cent. If you do that you are giving to your organization a great saving, intangible, but nevertheless, it is well worth the investment of the time it takes.

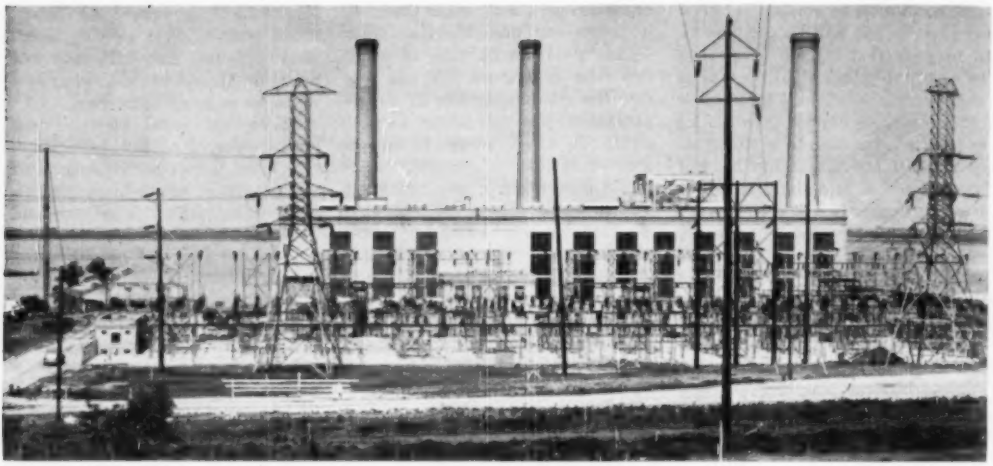
Turbine For Mexico, Missouri

This 11,500-kw steam turbine will soon be augmenting the already extensive power generating facilities of the Missouri Power and Light Company's transmission system throughout the northern part of Missouri.

The big machine is shown receiving final inspection from officials of the utility company at the Sunnyvale, California, Plant of the Westinghouse Electric Corporation where it was built. In the center, F. D. Fletcher, Superintendent of Generation for the Missouri Power and Light Company, is listening to the turbine's operation through a king-sized "stethoscope," while his firm's chief engineer, C. B. Owens, right, looks on. At the left is George Gayer, Chief Engineer of the Sunnyvale plant.

The picture was taken while the turbine spindle was turning at 3,600 revolutions per minute, its full rated speed.





MOUNTAIN CREEK LAKE—AN ARTIFICIAL FORMATION OF 30,000 ACRE-FEET IS SHOWN IN THE BACKGROUND OF THIS EXTERIOR VIEW OF THE POWER STATION. THE LARGER STACK AT THE RIGHT SERVES UNIT NO. 3.

Mountain Creek Station—Dallas

Dallas Power & Light Company adds 66,000 KW as Unit No. 3 of its Mountain Creek steam-electric station.

THE backbone of industry is power and the Mountain Creek Station of the Dallas Power and Light Company supplies a large share of that power to the ever increasing industrialized area of Dallas and vicinity.

The Mountain Creek Station on the shores of Mountain Creek is an impressive sight as one reaches the crest of a series of green clad hills a few miles west of Dallas, Texas. Units No. 1 and No. 2, put into operation in 1938 and 1945 respe tively, supplied 60,000 kw while unit No. 3 which went into operation April 28, 1949 has more than doubled that capacity.

Generating Unit

The 66000 kw turbine generator of Unit No. 3 was furnished by the General Electric Company. The steam turbine, of twenty stages, is of the extraction type with the extraction points in the 8th, 12th, 15th and 17th stages. The turbine and generator operate at 3600 rpm.

Design conditions for the turbine are: steam pressure 850 psig, 900F; exhaust pressure 1.5 in. mercury absolute. The generator is hydrogen cooled and is designed for 13,800 volts, 60 cycles, 3 phase.

Boilers

Two boilers, designated as No. 3A and No. 3B, supply the steam for Unit No. 3. Both boilers were installed by the Babcock and Wilcox Company.

Boiler No. 3A is the two-drum Stirling type having a capacity of 450,000 pounds steam per hour at 1000 psig and 905 F. This boiler has 23,445 square feet of heating surface and 4074 square feet of water cooled wall surface.

Boiler No. 3B is the integral furnace type with a capacity of 250,000 pounds steam per hour at 1025 psig and 905 F. There is 16,275 square feet of heating surface with 2951 square feet of water wall heating surface.

Both boilers have Babcock and Wilcox steam superheaters. In No. 3A the steam temperature is controlled by a damper which bypasses part of the furnace gasses. In No. 3B the final steam temperature is controlled by a drum type Babcock and Wilcox Attemperator. Steam temperature control is accomplished by passing a portion of the steam through coils in the lower boiler drum.

Combination oil and gas burners furnished by the Forney Engineering Company are used on both boilers.

Both boilers are of the semi-outdoor type. The building encloses the front end or firing aisle while the rest of the boilers along with the forced and induced draft fans and the air pre-heaters are outside. This is common practice

PRINCIPAL EQUIPMENT — UNIT NO. 3
Mountain Creek Station — Dallas, Texas

TURBINE GENERATOR AND AUXILIARIES

Turbine Generator — 1—General Electric Co. 60,000 kw, 20 stages, 3600 rpm, max. cap. 66,000 kw, 850 psig, 900 F, 1.5" Hg. exhaust pr. Extraction points: 8th, 12th, 15th, and 17th stages. A-C generator, hydrogen cooled, 2 poles, 60 cycles, 3 phase, Y connected for 13,800 volts. Rating at 0.5 psig hydrogen: 70,588 kva at .85 pf. Armature—2954 amps, field 635 amps, exciter 250 volts. Capacity at 15.0 psig hydrogen: 81,176 kva at .85 pf., armature 3,397 amp, field 700 amp.

Condenser — 1—Foster Wheeler Corp. 50,000 sq ft tube surface, 92,500 gpm circulating water.

Feedwater Heaters — 3—Griscomb Russell Co. Closed type; one low, one intermediate, and one high pressure.

Deaerator — 1—Cochrane Corp.

BOILERS AND AUXILIARIES

Boilers — 2—Babcock & Wilcox Co. 1—Two drum Stirling, 450,000 pounds per hour, 1000 psig, 950 F, 23,445 sq ft heating surface, 4074 sq ft water wall surface; bypass damper type superheater. 1—Integral furnace type 250,000 pounds per hour, 1,025 psig, 905 F, 16275 sq ft heating surface, 2,951 sq ft water wall surface; drum type attemperator superheater.

Air Preheaters — 2—Air Preheater Corp. Ljungstrom type one vertical, one horizontal.

Forced Draft Fans — 2—Sturtevant Div., Westinghouse, with movable inlet vanes. One rated: 121,000 cfm, with 400 hp motor. One rated 65,000 cfm, with 200 hp motor.

Induced Draft Fans — 2—Sturtevant Div., Westinghouse, with movable inlet vanes. One rated: 203,000 cfm, with 800 hp motor. One rated 108,000 cfm with 300 hp motor.

Burners — Forney Engineering Co. Combination gas and oil.

Water Softeners — Permutit Corp. Zeolite softening system.

Circulating Pump — Foster Wheeler Corp. 46,-300 gpm at 30 ft head.

Boiler Feed Pumps — 2—Ingersoll-Rand, each 4 stage, 1750 gpm at 2650 ft head, 3575 rpm. One driven by 1500 hp, 2300 volt, 3560 rpm, General Electric motor and the other by 1500 hp, 850 psig, 52 psig back pressure, 3560 rpm Terry steam turbine.

INSTRUMENTS AND CONTROLS

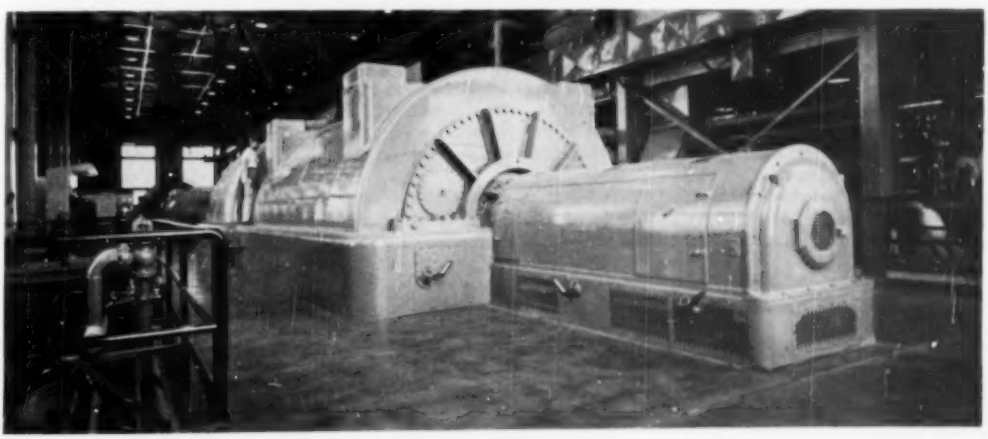
Combustion Control — Bailey Meter Co.
Water Level Control — Bailey Meter Co.

in the Southwest and has effected savings of millions of dollars in building costs.

An unique feature at Mountain Creek is the air conditioning system for the superintendent's office and the various other rooms in the building. Water from the lake is pumped through finned surface coils supplied by the Trane Company while air from two Buffalo Forge Company fans is passed through chain type filters rotating through an oil bath and then is cooled by the lake water circulating through the coils.

The average heat rate for all three units of the Mountain Creek Station for July 1949 was 12,800 btu per kw hour. No official data have been compiled for Unit No. 3, but the rate is known to be much lower, probably in the order of 11,800 Btu per kw hour.

INTERIOR VIEW OF MOUNTAIN CREEK STATION SHOWING THE 66,000 KW GENERATING UNIT NO. 3.



SEARS, ROEBUCK AND COMPANY PLANT—GREENSBORO, N. C.

Windowless Industrial Plants

Windowless construction provides better working conditions, reduces first cost and maintenance, and improves the product.

By Roy Palmer
Duke Power Co., Charlotte, N. C.

SMART management, architects, and engineers are planning and erecting better industrial buildings than ever before. The trend to windowless buildings is resulting in lower operating cost, improved quality of product, reduced construction cost, and better working conditions. The development of industrial air conditioning and the application of high level lighting has had much to do with making such buildings practical.

Production men have long realized that the elimination of windows would improve over-all plant operation, but hampered by tradition and the fear that employees might complain of claustrophobia, they hesitated to brick up windows in existing buildings or plan new structures without windows.

Objections Overcome

Experience has already proven that objections on the part of employees can be easily overcome. Certainly, most persons would rather work in clean, well lighted, controlled temperature rooms than in rooms dependent on windows for light and ventilation. Sanitary conditions in windowless buildings are infinitely better than in a structure where dust and dirt are constantly brought into the rooms through windows. It should be obvious that clean, filtered air, frequently changed and controlled in temperature and humidity, is healthier and more pleasant than air circulated by ordinary ventilation.

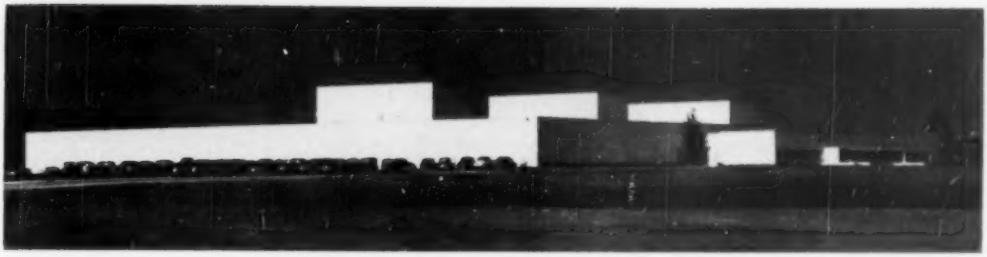
As for claustrophobia, one only has to be reminded that theaters, many restaurants, and most large retail sales buildings are windowless, and few people, whether employees or the general public, complain of a "closed-in" feeling. Furthermore, crowding and cluttering of fixtures make conditions in those places more encouraging to claustrophobia than in a plant.

From the standpoint of the worker, more comfortable, pleasant, and healthier working conditions result from windowless construction. These advantages, in turn, make possible better work and improved volume without increased fatigue. Workers on piece work are in a particularly favorable position.

Air Conditioning

Controlled humidity has long been recognized as a necessary adjunct to many industrial processes. This is particularly true in textile mills. To adequately control the moisture in the air, it is necessary to seal the room from outside influences. This makes the room oppressively hot in the summer months, so it is desirable to control the room temperature as well. With such controlled conditions, windows are not only unnecessary but actually undesirable.

In food processing plants the



GERRISH MILLIKEN MILL—PENDLETON, S. C.

need for clean, cool, and humidified air is obvious. Cigarettes are better because they are made in plants where the artificial weather is favorable. Paint and spray rooms offer the possibility of better finishes where temperature and humidity are controlled. This list might be continued until it included a large part of Southern and Southwestern industry.

A square foot of brick wall costs considerably less than a square foot of glass. Even more important, the reduction of exposures through which heat is lost in winter means that a saving can be made on the first cost of the heating system and in its operation. Similarly, the capacity of the air conditioning system and its cost of operation are reduced. Engineers and architects who are alert to these facts design buildings to reflect heat in the summer and conserve it in winter.

Lighting

One of the prime purposes of windows is to bring daylight into the room. In the days before artificial lighting had been developed to its present stage, this was most important to plant production. At that time, however, demands on machinery and on the worker were not as exacting as today. Now, unit production costs must be watched with a critical eye; seconds must be reduced to a minimum; working conditions must be the best possible. To all of these, good illumination is extremely important.

The disadvantages of lighting through windows are many. The level of daylight falls off very rapidly as the distance from the window is increased. Workers in the middle of the room are handicapped in their seeing. Since light speeds sight, the worker is slowed in his operations and production suffers. Flaws are not seen easily, and rejects increase.

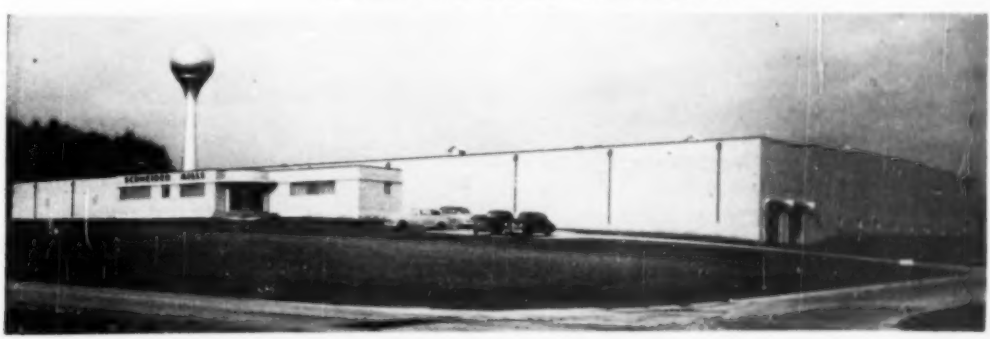
Sawtooth construction to provide light in the interior of large rooms is too costly today, both from the standpoint of first cost and of maintenance. Then, too, even if daylight distribution could satisfactorily and economically be accomplished, it would not be satisfactory on cloudy mornings or in late afternoons in winter. Where two shifts are working, a portion of each would require artificial lighting to supplement failing daylight. No matter how ideal natural conditions might be, daylight varies in intensity from hour to hour, and inspectors or others depending heavily on sight for good work must continually be adjusting to changing conditions.

Properly engineered modern lighting systems can provide high-level illumination uniformly throughout the entire work room. This not only permits the employee to see more easily, quicker, and more comfortably, but also creates a pleasant, cheerful atmosphere.

Almost all old industrial plants with large window areas and many newer plants have painted their window glass because it has been found that the glare at certain times of the day is too severe for the employee's comfort. It seems ridiculous as well as expensive to put in window areas for the express purpose of providing light and then block out 90 to 95 per cent of the light with paint.

Shades, venetian blinds, awnings, and similar means of controlling glare in a plant are too costly to purchase, install, and maintain. Moreover, they require

A MODERN INDUSTRIAL PLANT—TAYLORSVILLE, N. C.



the time and attention of some employee to adjust them at various times of the day if they are to be effective. Many smart production men, realizing these facts, have removed the windows from their plants and bricked them in.

Instead of constructing a new building according to precedents established in the past and then adjusting machinery, air conditioning, heating, and lighting to the building, it is less expensive to plan "from the inside out" and design the building or remodel the old one to cover production equipment. Such a building can be architecturally beautiful, and those responsible for its design will have the satisfaction of knowing that the money invested was well spent.

Steam In Process And How It Works

By S. D. Distelhorst
Cochrane Corporation

Steam used for process heating is not like the steam that is used for power. Here's why — in plain language.

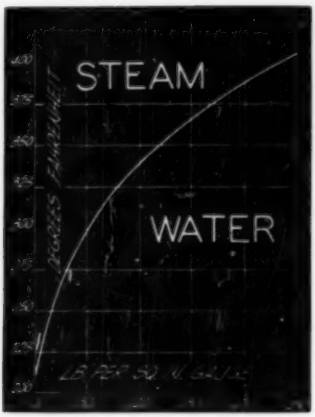


CHART COMPARISON OF SATURATED STEAM TEMPERATURE VS. GAUGE PRESSURE.

WATER is converted into steam by absorbing sufficient heat to vaporize the water. At atmospheric pressure, zero pounds per square inch gauge pressure (psig) or 14.696 pounds per square inch absolute pressure (psia), evaporation occurs at a temperature of 212 F. At 100 psig, or approximately 115 psia, evaporation occurs at 338 F. In other words, at this temperature and this pressure the water can exist either as a liquid or as a vapor. This temperature-pressure relationship is obtained from standard steam tables and is illustrated graphically in the accompanying curve.

Vaporization and Condensation

The essential value of steam in process heating, cooking, or drying lies in the tremendous heat of vaporization — latent heat — absorbed when water is converted into steam and released when steam condenses back into water. Water has approximately 1 Btu per pound per degree F above 32 F—180.07 Btu/lb at 212 F; 309.11 Btu per lb at 338 F corresponding to 100 psig. But the heat absorbed in the water during its conversion into steam and released again to the cooking, heating, or drying process upon reverting back to water is 970.33 Btu per lb at 212 F or 870.6 Btu per lb at 338 F (100 psig).

It is apparent from the accompanying steam table that the heat of vaporization becomes gradually less as steam pressure increases. The obvious deduction is that low pressure steam would provide more effective heating, cooking, or drying in processing operations. This is true and is the reason for preferring utilization of relatively low-pressure turbine exhaust rather than boiler-pressure steam in most process work. And, in many cases, sub-atmospheric systems operating at less than zero pressure in the vacuum range. In vacuum systems special fittings and valves must be used to minimize air leakage into the system. Vacuum pumps to handle the condensate are frequently bulky and must have tremendous air handling capacity even under optimum conditions.

In spite of the greater Btu per lb at very low pressures, the volume occupied by a pound of steam is considerably larger at low pressures. A pound of steam at zero gauge pressure occupies 26.80 cu ft—at 100 psig this becomes only 3.882 cu ft. Thus the heat of vap-

STEAM TABLE

PRESSURE			TEMPERATURE	HEAT (ENTHALPY), BTU/LB		
in. mercury	psia	psig	F	Liquid	Evaporation	Total
0.18"	0.088	—	32	0.00	1,075.8	1,075.8
29.92"	14.696	zero	212	180.07	970.3	1,150.4
—	40.	25.	267.25	236.03	933.7	1,169.7
—	65.	50.	297.97	267.50	911.6	1,179.1
—	115.	100.	338.07	309.11	870.6	1,189.7
—	165.	150.	366.00	338.54	857.0	1,195.6

COIL COOKERS, USED FOR THE EVAPORATION OF TOMATO PUREE, USE RELATIVELY HIGH PROCESS STEAM PRESSURES OF 100 PSIG TO 150 PSIG.

orization at 0 psig is only 36.2 Btu per cu ft while it is 225 Btu per cu ft at 100 psig—the same amount of heat being contained in one sixteenth of the volume. Thus heat transfer surface areas can be smaller at higher pressures. Piping and process equipment can thus be smaller, more compact, and—until excessive pressure conditions make costs unduly high—less expensive.

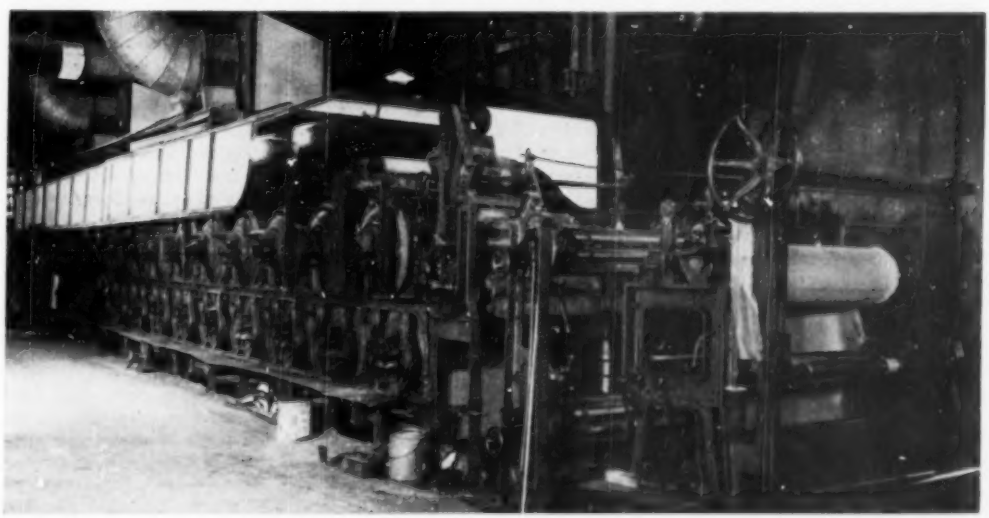
Superheat

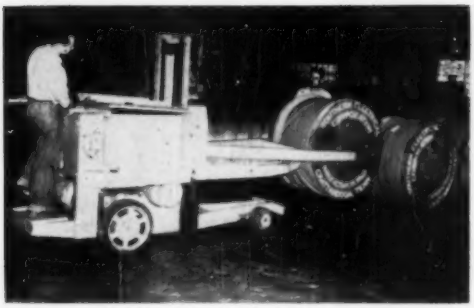
While superheating is of distinct advantage in operating a turbine or engine, it is usually detrimental to maximum heat transfer in process equipment. Superheating is accomplished by maintaining the pressure and adding heat to the steam after it has been removed from contact with the water. The total heat of superheated steam is equal to the total heat of dry saturated steam corresponding to its pressure plus the heat of superheating. The result is an increase in both temperature and volume with properties that approach those of a perfect gas. In engine and turbine performance, where steam is exhausted uncondensed from the prime mover, the internal energy increment added by superheating can double the amount of heat available for conversion to useful mechanical work from less than 15% to about 30%.

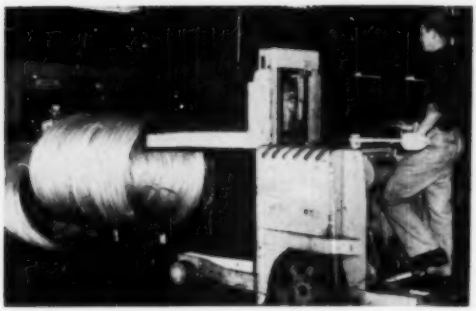
However, this additional heat is still small in comparison to the latent heat of condensation of the steam which cannot be released in process equipment until the superheated steam has been cooled down. Condensation cannot take place in steam that is superheated. Therefore, dry saturated steam provides the maximum Btu heat release in steam process equipment.

The principal source of superheated process steam is from turbine bleed points, or from turbine or engine exhaust, and rarely exceeds 50 degrees Fahrenheit of superheat. In cases of this type, superheat is ordinarily absorbed in the process equipment together with the latent heat of condensation and no serious heat transfer problem is presented.

PAPER MACHINE DRYERS USE TURBINE OR ENGINE EXHAUST STEAM AT PRESSURES FROM 10 TO 50 PSIG.







THIS REEL-HANDLING ATTACHMENT, DEVISED AND BUILT AT THE PLANT OF THE SOUTHERN ELECTRICAL CORPORATION IN CHATTANOOGA, PERMITS THE EASY HANDLING AND PLACEMENT OF LARGE REELS. PLACEMENT IN, OR REMOVAL FROM, STORAGE OF LARGE COILS OF HEAVY WIRE AT THE SAME PLANT HAS BEEN SIMPLIFIED WITH ATTACHMENT AT THE RIGHT. 5,000 LB OF WIRE IN COILS IS HANDLED IN A SINGLE OPERATION.

Fork Trucks Cut Costs In Two Chattanooga Plants

Special attachments multiply usefulness at Southern Electrical Corporation's plant. Utilization at the Norge Division of the Borg-Warner Corporation has eliminated a heavy expenditure of man-power.

SINCE the greater part of the task of material movement at its wire mill consists of handling coils and spools of copper, aluminum, or steel wire and cable, management of the Southern Electrical Corporation, Chattanooga, Tenn., manufacturers of wiring cable and conductors, wanted to find some better method of utilizing its fleet of four, 6,000-lb capacity, storage battery-powered highlift platform trucks for the work.

Plant engineers and shop men devised and constructed two devices to fit on the platform, one for handling coils, the other to handle large spools, or reels. Both devices can be attached to, or removed from, the trucks in a matter of seconds, through formed steel pieces welded to the back plates of the trucks' platforms. These pieces do not, in any way, interfere with the use of the trucks for conventional skid platform handling.

Handling Coils

For the handling of wire coils —on receipt, into storage, thence into process and finally, as wrapped coils, into outward shipment—a piece of railroad T-rail, approximately 10 ft long is used. At one end a piece of steel, with a projecting lug, has been welded. This lug fits into a clamp, or socket, which is welded onto the back plate on the truck platform. The rail is covered with a piece of automobile tire casing held to protect the coils from unnecessary abrasion.

When coils of wire are unloaded from railroad cars, the truck is moved up to the car door and the platform raised about 2½ ft. Coils are placed on projecting T-rail manually. Each coil, as received, weighs from 250 to 265 lb. Approximately 20 coils are carried in one load. When placed in storage the coils either are placed in interlocking, or "corded" tiers from three to five high, or are lowered and deposited on the floor and the rail withdrawn. In the "carding" operation, the handling of coils is manual.

Originally, coils of wire were placed manually on the truck platform, then moved to storage and manually unloaded. It would take approximately four and a half man-hours for the unloading and storaging of a carload of wire of a total weight of between 75,000 and 80,000 lb. With the T-rail device the operation's time, employing two trucks, has been reduced

to approximately 45 minutes, with four men at work, or a total of three man-hours.

Handling Spools

In the handling of spools and reels of wire the second plant-devised attachment is utilized. This is made from two small I-beams which are welded at one end to form the point of a "vee." About two feet from the point, to which a projecting lug similar to that used with the T-rail has been welded, the legs are bent back parallel and a cross-brace welded between them. At the far end of each leg a seat for a round rod, or mandrel, has been welded. In use the attachment is fitted under the steel piece welded to the backboard of the truck, and the body rests on the platform, the parallel legs extending horizontally beyond the platform's end.

A mandrel is run through the center hole of the spool and the truck moves up, with platform lowered, until the seats are under the rod. When the platform is raised the spool likewise is raised from the floor and is then carried to wherever it is to be used. In the case of small spools this usually is at the end of the stranding machines. The larger reels, containing finished product, are handled in like manner.

Each of the four trucks can raise its platform to a height of 58 in. and sometimes are utilized by the maintenance crew for work about the plant, while they also are used to handle skid-loads of various materials.

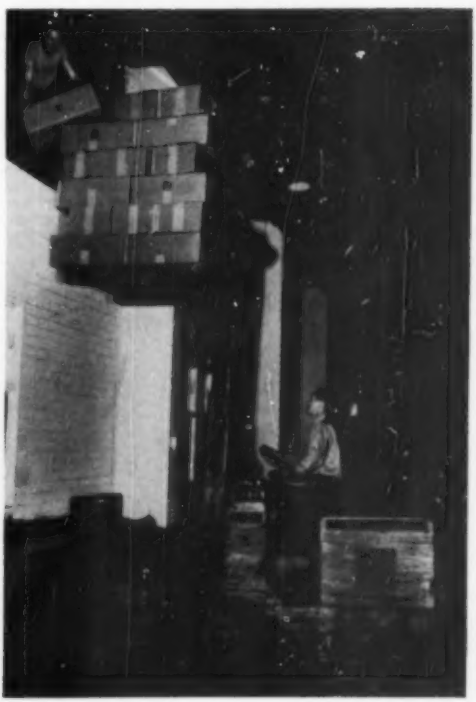
Advantages

The trucks were acquired when the plant began operations in February, 1947, and, according to J. E. Jernigan, Purchasing Agent, "they have enabled us to maintain the speed of our production and also have helped speed up shipping." Flow of raw materials from receipt into storage and in process likewise has been accelerated. With the trucks in service eight hours a day, Mr. Jernigan said that if the work done by the trucks had to be performed by manual means "we would need another thirty to forty men here in the plant." He added: "There has been no unscheduled loss of service, their maintenance costs have been negligible and their operating costs, slight. We think for our work that they are one of our best investments."

Diversified Uses

Since installation of a fork truck for handling material, operating officials at the Chattanooga plant of the Norge Division of the Borg-Warner Corporation have found that the drudgery and strain has been removed from handling and storaging tasks. In addition there has been a material decrease in the man-hours previously expended on these operations, which savings have been applied to more productive operations.

Adoption of this system of handling has made it possible for them to receive parts from many suppliers, and to ship their ware, in unit loads. This receipt of parts has been combined into a single operation of movement from car-door directly into the stockroom.



RIGHT—HITHERTO WASTED SPACE ABOVE OFFICE ENCLOSURES WITHIN THE NORGE FACTORY, HAS BEEN MADE AVAILABLE FOR STORAGE OF PRODUCT AWAITING OUTWARD SHIPMENT. ALTHOUGH PACKAGES ARE MANUALLY LOADED OR REMOVED WHEN THIS SPACE IS UTILIZED, FLOOR AREA OF PLANT IS KEPT CLEAR FOR MORE PRODUCTIVE PURPOSES, AND CONSTRUCTION OF ADDITIONAL WAREHOUSE AREA HAS BEEN AVOIDED.

BELOW—STRAPPED-TO-SKID UNIT LOADS OF PARTS ARE UNLOADED AT CAR DOOR BY FORK TRUCK AT THE CHATTANOOGA PLANT OF THE NORGE DIVISION OF BORG-WARNER CORPORATION. ADOPTION OF THE UNIT LOAD SYSTEM OF HANDLING INCOMING AND OUTGOING MATERIALS HAS RESULTED IN SUPPLIERS SHIPPING WARE IN UNIT LOADS.

Within the plant, which is engaged in the mass production of refrigerator compressor units trucks also are utilized for movement of parts and assemblies from storage into production, also through processing operations and into packaging and thence to outward shipment.

Unit Loads

At least three outside suppliers shipping to the Chattanooga Plant in palletized unit loads, or in strapped-to-skid loads, utilize similar unit load systems of handling within their own plants. These are the electric motor sources which ship supplies of rotors and stators in strapped loads on all-wood pallets. Shipments are received in car-load lots. The heavy-duty fork truck at the Norge Division's plant works at the car door from driveway level at the rail siding in the plant's yard, removing the pallets, or skids, from the car and transporting them directly to the motor storage room. Here the loads are tiered awaiting requisition for assemblies. Two to three men work within the car with hand-pack trucks, bringing the unit loads to car-door for removal by the fork truck.

Another task performed in the plant yard is the handling of supplies of castings and forging which are received in highway trailer-truck loads. Special containers, similar to a skid-bin, are placed at the trailer's tail-gate by the fork truck. When the bins are filled by manual means, they are moved into the plant's store room, and tiered three- to four-high.

When not utilized to handle incoming, or outgoing shipments, the fork truck operates within the plant, servicing various departments, either with material from stock and store rooms, or in moving work in process from operation to operation. The fork truck also is used in maintenance work about the plant. At times machinery is moved, while waste- and scrap-bins are supplied to, or moved from, various sections of the plant's floor where operations are in progress.

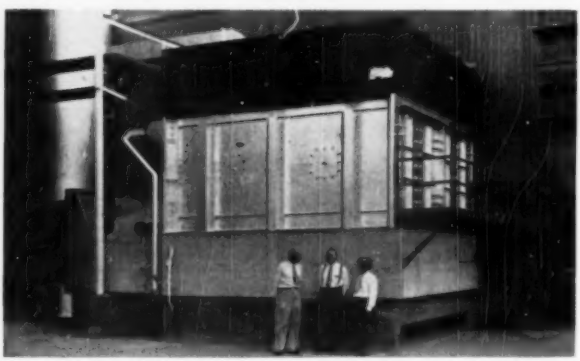
Because of the length of the plant, and with a desire to avoid unnecessary travel time, de-centralized charging units are maintained, one at each end of the long building housing the plant. This enables the charging of the storage batteries at a point close to where the truck happens to be working during the regular "down-time" at night and during meal periods when unusually heavy operations place more than a normal drain on the battery.

Recuperator for O. G. & E. Gas Turbine Plant

View of recuperator for the first central station gas turbine installation in the U. S. This installation recently went into service at the Arthur S. Huey Station of the Oklahoma Gas & Electric Co., Oklahoma City.

The recuperator, built by Combustion Engineering-Superheater, Inc., utilizes the heat in the exhaust gases from the gas turbine to heat boiler feedwater for the adjoining steam power plant.

The new installation has increased the total station output by 7000 kw, of which the gas turbine accounts for approximately 4000 kw, while the remaining 3000 kw are obtained in the steam plant through recovery of heat from the gas turbine exhaust by the recuperator. The design of the recuperator is similar to that of an economizer used to preheat boiler feedwater. For detailed performance data, see the December issue of SP&I.



Foundation Bolts

IN pouring foundations for compressors, whether they be small or large in size, it is the common practice to install large bolts that are bent at an angle and securely buried in the concrete and brought up to fit the holes in the base of the machine.

We have found that it is best to arrange so that these bolts are removable. In the past we have encountered crystallization of these bolts due to a very slight sliding action of the machine on the base with the result that the bolts will break off. If they are not removable from the concrete base, the entire foundation must be destroyed and a new one built.

To overcome this, we arrange to leave a square hole at the base directly through the foundation and centered in line with each pair of bolts so that a steel plate may be inserted through this opening. The bolt is dropped down from above and a nut put on the underneath side. If the bolt is broken at any future date the remaining part may be slipped out of the hole in an upward direction and a new one installed.

G. F. BENN

A Cost Reduction Case Study

Milling production was stepped up 25 per cent in this Baltimore aircraft manufacturing plant.

HOW the breaking of a machine shop "bottleneck" has led to an improved operations program highlighted by a 25% increase in milled parts production, is disclosed by Robert L. Evans, Manager of Planning and Operations, The Glenn L. Martin Company—in a recent issue of *The Martin Star*.

This achievement in costs reduction began as a routine project—that of finding a solution to the problem presented by a temporary overload of work in the Milling Section, due to the scheduling of two contracts to reach the shop simultaneously.

Out of a conference at which the vice-president in charge of manufacturing and the factory manager reviewed the problem with executives of the Tool Planning, Tool Manufacturing, Production Control and other affected departments, came the decision to find ways and means for absorbing the overload by somehow increasing the milling output.

The resulting methods analysis embodied a breakdown of mill operations in terms of running time and of idle time on the machine. This became the basis for the revamped operations program which has increased running time on the milling machines by 50%, and total production of parts by better than 25%—representing savings of many thousands of dollars every week.

The idle time was analyzed to show the proportions of time assignable to each of the following: job planning; layout; tooling; work set-up; reset-up; leader inspection; and miscellaneous causes. The next step was to determine the reasons for the idle time clocked in each category.

Each category of idle time was explored with a view toward keeping the machines more continuously in use. Thus, under the head of job planning, the survey placed all losses of run time due to the poor sequencing of the separate steps in the milling of particular parts. Too often determination of the machining routine was incomplete.

In hogging out one of the parts for an experimental bomber, for example, there are about sixty distinct operations. Although it is not feasible to plan all of these in advance, it is practical to establish groups of operations—and to plan the correct sequencing within these groups. Here experience must be brought to bear. That job planning in the shop be done at the supervisory level, was one of several recommendations whose adoption has resulted in substantial savings.

Turning from the idle-time reduction phase of the analysis to that concerned with ways and means for increasing the productivity of the machines on the run time available, the methods men made a number of suggestions for streamlining the step-by-step performances of the operator at his work. In addition, the application of methods engineering principles paid big dividends in a number of special cases—of which the following is an example.

The bracket for a main beaching gear was originally loaded on the work table and milled—one unit at a time. The operator had to stop the machine while loading each successive part in the vise. This aggregated a considerable amount of idle time. The improved method depends on the use of a rotary work table—with ten nesting fixtures located around its periphery. Production has been increased, since the operator is himself constantly occupied in loading the parts—and while he is doing this, the machine keeps chipping away.

Out of this methods research project also, has come a stricter alignment of machine shop personnel according to individual aptitudes and special skills—with a resultant improvement in their overall effectiveness. The bottleneck, of course, never materialized.

GENERAL FOREMAN, BESIDE SECTION FOREMAN AND LEADER, DISCUSSES PART BEING HOGGED OUT OF BLOCK OF ALUMINUM. JOB PLANNING IS THUS COORDINATED AT SUPERVISORY LEVEL.

THIS CRUSHING ROLL INSTALLED AT A SAND & GRAVEL PLANT ON THE CUMBERLAND RIVER NEAR NASHVILLE, TENN., IS DRIVEN BY TWO ALLIS-CHALMERS 25 HP INDUCTION MOTORS. HIGH STARTING TORQUE IS REQUIRED ON THESE MOTORS TO BREAK AWAY AND ACCELERATE THIS CRUSHER LOAD. EXTRA STARTING TORQUE IS SUPPLIED BY A SECOND CONCENTRICAL SQUIRREL-CAGE MOTOR WHOSE HIGH RESISTANCE SERVES TEMPORARILY TO INCREASE TORQUE IN THE SAME MANNER AS AN EXTERNAL RESISTOR WOULD ON A WOUND ROTOR MOTOR.

Motors — Controls — Starters

Selection and Application Simplified

There are usually several types of motors and starters that would serve a particular purpose, but good engineers strive for the best combination.

By Joseph Bronaugh

District Office Manager
Allis-Chalmers Mfg. Co.
Miami, Florida

PROBABLY no one will dispute what constitutes a motor. But agreement ends there when troubles arise from conflict of interests and problems peculiar to the user, the engineer, the contractor, the power company, or the manufacturer.

Everyone generally understands that the work-horse of electric power, the squirrel cage induction motor, is sometimes displaced by other types. These may be d-c motors, when critical speed adjustment is required, or wound-rotor motors for very high starting torques such as hoists, or the same wound-rotor type for very low starting currents such as on a big air conditioner fed by the lighting circuit of a large department store. There are many other types. Seldom, however, can the multiplicity of motor choices justify the confusion caused by referring to a gas engine as a "motor."*

Starter and Control Not Identical

This same confusion arises when the terms "control" and "motor starter" are considered. On the lighter side, it has been asked why the motor needed a starter if it was supposed to start itself. But the genuine confusion is not as much between the terms "controller" and "starter" which interchangeably designate motor control equipment, as between the several types of starters that are used with each kind of motor.

One of the simplest choices is between a manually operated and

*Editor's Note: While the dictionary does not support the author in his feeling that a gas engine is not a motor—the electrical field has rather thoroughly usurped the term. We agree with the author. We would not call a gas engine a motor—Mr. Webster, notwithstanding.

electrically operated starter. The manual starter serves as a switch or relay through which a man with nominal effort can control large horsepower in motors. But if electrically operated, then the starter will respond to the minute forces of a water pressure gauge, or a thermostat, or a reflected radar wave to control even larger blocks of power.

Source of Starting Current

The ability to satisfactorily supply the extra power needed to overcome the inertia of a motor and its load at standstill is a perennial motor and control problem. On top of this starting a motor from standstill draws additional heavy current which does no good but, nevertheless, must be supplied. A man with a 100-hp generating plant would be unable to start a 100-hp squirrel cage motor because the momentary starting demand would necessitate a power plant of at least 300-hp, and without the use of a reduced voltage starter it would draw five to eight times normal full-load current. Even the diversity factor of having many motors supplied by a large plant would alter the disturbance one motor user could make for his neighbors only in degree.

Reduced Voltage Starters

Instead of building oversize copper circuits, transformer stations and power plants, the solution for squirrel cage motors above, say 7½ hp, is to use starters which will limit the current and the speed of acceleration during the starting period. A common type of reduced voltage starter contains an auto-transformer with reduced voltage taps of 65 per cent and 80 per cent. The motor is first connected to either of the taps until it comes part way up to speed when the auto-transformer is cut out and the motor connected directly to the full-line voltage. Since the motor at standstill is essentially a reactor, the initial and maximum current through it will be proportional to the voltage applied. Because an auto-transformer is used, the current from the line is further reduced and will only be in proportion to the square of the motor voltage. Thus, when starting on the 80 per cent voltage tap, the demand will be only 64 per cent of the kva required to start with across-the-line starters.

Another common reduced voltage starter is the series-resistor type, or its near relative the series-reactor type. These starters only reduce the current demand on the line in proportion to the voltage applied to the motor and thus will draw more current than the auto-transformer type when producing the same motor starting torque. But they have one distinct advantage. The amount of disturbance to the system voltage is much less, for the current is not reduced to zero in the middle of the starting sequence, during switching to the running connection.

Everything said about squirrel cage motor starting is generally true of synchronous motors which are built with a modified squirrel cage or amortisseur winding just for starting. The controllers are essentially the same but with the addition of magnetic contactors to apply current to the field winding at the time the motor is just ready to pull into synchronism. These contactors can be actuated in a haphazard manner by timing relays as if frequently satisfactory, or refinements can be added which will insure that the motor is first near synchronous speed. Other refinements will apply the field when the rotor is at just the most favorable angle out of phase to obtain the best pull-in torque and the least voltage disturbance to the system.

Reduced Starting Demand Schemes

Many special means for reducing the starting demand of a motor are resorted to. Large motors are sometimes built with series-multiple, or delta-star, or extra windings, which are specially connected to obtain high reactance for starting. This eliminates the need for an auto-transformer. Other efforts have been made to improve the motor winding.

Smaller squirrel-cage motors were formerly wound without regard to need for lower starting current. Reduced voltage starters were commonly used anyhow as many older motor windings were not capable of withstanding the mechanical shock of full voltage starting current. These motors are now made with so-called low starting current windings which, however, still means approximately five times normal full load current. Another modification is a motor with two squirrel cages, one inside the other. This is principally to give the motor a high starting torque which is required on refrigeration compressors, rock crushers and vibrating screens and other hard to start equipment. The high-torque motors afford at the same time the so-called low starting current feature, which, as pointed out above, is in reality not very low.

Starting Torque Standards

New standards for squirrel-cage induction motors which allow selection by torque as well as starting current were adopted January 1, 1948. They are designated "Design" A, B, C, D, and F. Design "B" is the general purpose motor. Design "C" is the so-called high-torque motor and has the higher standstill torque for hard starting loads. With these designations there is greater assurance now that the motor will be suited to the load.

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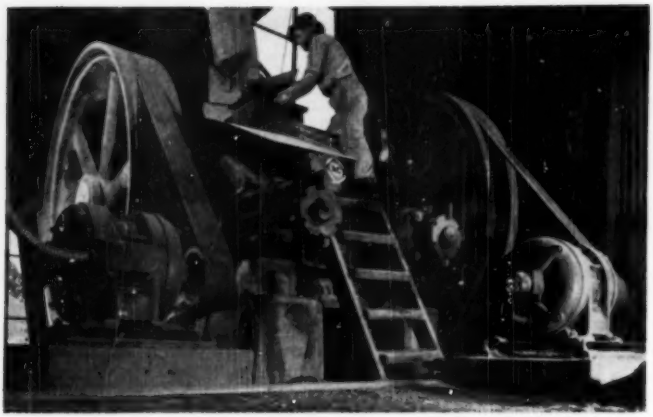

THIS CRUSHING ROLL INSTALLED AT A SAND & GRAVEL PLANT ON THE CUMBERLAND RIVER NEAR NASHVILLE, TENN., IS DRIVEN BY TWO ALLIS-CHALMERS 25 HP INDUCTION MOTORS. HIGH STARTING TORQUE IS REQUIRED ON THESE MOTORS TO BREAK AWAY AND ACCELERATE THIS CRUSHER LOAD. EXTRA STARTING TORQUE IS SUPPLIED BY A SECOND CONCENTRICAL SQUIRREL-CAGE MOTOR WHOSE HIGH RESISTANCE SERVES TEMPORARILY TO INCREASE TORQUE IN THE SAME MANNER AS AN EXTERNAL RESISTOR WOULD ON A WOUND ROTOR MOTOR.

Motors — Controls — Starters

Selection and Application Simplified

There are usually several types of motors and starters that would serve a particular purpose, but good engineers strive for the best combination.

By Joseph Bronaugh

District Office Manager
Allis-Chalmers Mfg. Co.
Miami, Florida

PROBABLY no one will dispute what constitutes a motor. But agreement ends there when troubles arise from conflict of interests and problems peculiar to the user, the engineer, the contractor, the power company, or the manufacturer.

Everyone generally understands that the work-horse of electric power, the squirrel cage induction motor, is sometimes displaced by other types. These may be d-c motors, when critical speed adjustment is required, or wound-rotor motors for very high starting torques such as hoists, or the same wound-rotor type for very low starting currents such as on a big air conditioner fed by the lighting circuit of a large department store. There are many other types. Seldom, however, can the multiplicity of motor choices justify the confusion caused by referring to a gas engine as a "motor."*

Starter and Control Not Identical

This same confusion arises when the terms "control" and "motor starter" are considered. On the lighter side, it has been asked why the motor needed a starter if it was supposed to start itself. But the genuine confusion is not as much between the terms "controller" and "starter" which interchangeably designate motor control equipment, as between the several types of starters that are used with each kind of motor.

One of the simplest choices is between a manually operated and

*Editor's Note: While the dictionary does not support the author in his feeling that a gas engine is not a motor—the electrical field has rather thoroughly usurped the term. We agree with the author. We would not call a gas engine a motor—Mr. Webster, notwithstanding.

electrically operated starter. The manual starter serves as a switch or relay through which a man with nominal effort can control large horsepower in motors. But if electrically operated, then the starter will respond to the minute forces of a water pressure gauge, or a thermostat, or a reflected radar wave to control even larger blocks of power.

Source of Starting Current

The ability to satisfactorily supply the extra power needed to overcome the inertia of a motor and its load at standstill is a perennial motor and control problem. On top of this starting a motor from standstill draws additional heavy current which does no good but, nevertheless, must be supplied. A man with a 100-hp generating plant would be unable to start a 100-hp squirrel cage motor because the momentary starting demand would necessitate a power plant of at least 300-hp, and without the use of a reduced voltage starter it would draw five to eight times normal full-load current. Even the diversity factor of having many motors supplied by a large plant would alter the disturbance one motor user could make for his neighbors only in degree.

Reduced Voltage Starters

Instead of building oversize copper circuits, transformer stations and power plants, the solution for squirrel cage motors above, say 7½ hp, is to use starters which will limit the current and the speed of acceleration during the starting period. A common type of reduced voltage starter contains an auto-transformer with reduced voltage taps of 65 per cent and 80 per cent. The motor is first connected to either of the taps until it comes part way up to speed when the auto-transformer is cut out and the motor connected directly to the full-line voltage. Since the motor at standstill is essentially a reactor, the initial and maximum current through it will be proportional to the voltage applied. Because an auto-transformer is used, the current from the line is further reduced and will only be in proportion to the square of the motor voltage. Thus, when starting on the 80 per cent voltage tap, the demand will be only 64 per cent of the kva required to start with across-the-line starters.

Another common reduced voltage starter is the series-resistor type, or its near relative the series-reactor type. These starters only reduce the current demand on the line in proportion to the voltage applied to the motor and thus will draw more current than the auto-transformer type when producing the same motor starting torque. But they have one distinct advantage. The amount of disturbance to the system voltage is much less, for the current is not reduced to zero in the middle of the starting sequence, during switching to the running connection.

Everything said about squirrel cage motor starting is generally true of synchronous motors which are built with a modified squirrel cage or amortisseur winding just for starting. The controllers are essentially the same but with the addition of magnetic contactors to apply current to the field winding at the time the motor is just ready to pull into synchronism. These contactors can be actuated in a haphazard manner by timing relays as if frequently satisfactory, or refinements can be added which will insure that the motor is first near synchronous speed. Other refinements will apply the field when the rotor is at just the most favorable angle out of phase to obtain the best pull-in torque and the least voltage disturbance to the system.

Reduced Starting Demand Schemes

Many special means for reducing the starting demand of a motor are resorted to. Large motors are sometimes built with series-multiple, or delta-star, or extra windings, which are specially connected to obtain high reactance for starting. This eliminates the need for an auto-transformer. Other efforts have been made to improve the motor winding.

Smaller squirrel-cage motors were formerly wound without regard to need for lower starting current. Reduced voltage starters were commonly used anyhow as many older motor windings were not capable of withstanding the mechanical shock of full voltage starting current. These motors are now made with so-called low starting current windings which, however, still means approximately five times normal full load current. Another modification is a motor with two squirrel cages, one inside the other. This is principally to give the motor a high starting torque which is required on refrigeration compressors, rock crushers and vibrating screens and other hard to start equipment. The high-torque motors afford at the same time the so-called low starting current feature, which, as pointed out above, is in reality not very low.

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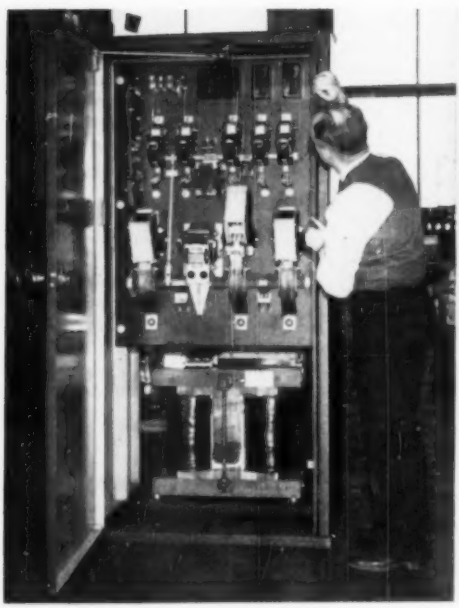
AN AUTO-TRANSFORMER STARTER.

A CIRCUIT BREAKER STARTER.



A MAGNETIC REDUCED VOLTAGE SQUIRREL CAGE STARTER.

FUSE TYPE STARTER FOR 200 HP SQUIRREL CAGE MOTOR.

ALL OF THE STARTERS SHOWN ABOVE WILL HANDLE LARGE MOTORS SAFELY IF THE POWER LINE CANNOT SUPPLY SHORT CIRCUIT CURRENTS IN EXCESS OF TEN TIMES THE MOTOR FULL LOAD AMPERAGE. BUT EVEN A SMALL MOTOR NEEDS A CIRCUIT BREAKER TYPE, OR SPECIAL CURRENT LIMITING FUSE TYPE STARTER IF THE LINE IS FROM A MORE POWERFUL SOURCE.

would certainly limit the duration of the starting disturbance, but it is not certain that it would allow the use of especially low torque, low starting current motors. The maximum torque of these special Design F motors is only about 135 per cent and requires a careful study of the load variations as well as the voltage supply before they can be applied. Consequently, the torque converting features of this coupling will still require as large a motor, and a motor of normal starting current. The only gain seems to be the quick die down of the initial "bump."

Starter Must Protect Self as Well as the Motor

Starters and controllers have other functions besides bringing motors satisfactorily from standstill to a running condition. They include over-current devices which both prevent the motor from running continuously under a damaging overload and which also will open the circuit should short circuit occur in the motor or on its leads. Even though the branch circuit feeding the motor is protected by fuses or circuit breakers, it is still necessary that the starter be able to withstand these short circuits without being itself destroyed. Fortunately, this consideration generally takes care of itself on low voltage circuits, such as 200 volts, since the impedance of transformer banks serving such circuits limits the short circuit. Motor circuits of 2,300 volts pose another picture.

The conventional magnetic 2,300-volt contactor starter either full or reduced voltage type, or the well known manual compensator will be found capable of interrupting only moderate short circuits; to be exact, this is 10 times the full load motor current. Heavier types of starters are generally necessary on 2,300-volt motors as the general purpose type of equipment might be mechanically or thermally destroyed in the short time it took the branch circuit fuses or circuit breaker to open.

What is done to make a starter withstand heavier short circuits? Incidentally, this has nothing to do with the hp or ampere rating of the starter. Heavier starters are built by replacing contactors with circuit breakers of the necessary interrupting capacity, plus bolstering the thermal and mechanical strength of overload coils, current transformers, conductors, etc. Another type incorporates a high interrupting capacity, current limiting fuse which has been coordinated with other parts of the starter and prevents their damage.

Fixed and Flexible Speed Control

Speed control is another function that can be provided by motor starters. Flexible speed control of a-c motors is rarely simple, and is often expensive. The wound rotor induction motor is the most common for variable speed but it wastes power in an external resistor about in proportion to the reduction in speed. But it can be easily adjusted by a rheostat to the speed wanted over a wide range. A modern improvement in liquid rheostats also gives the advantage of stepless control. These once cumbersome water rheostats have recently been made on a new principle in which the liquid is circulated through a heat exchanger and controlled in level by a movable weir, which gives a very compact machine.

When a few fixed speed changes will suffice it is more economical of power to use a pole changing motor. This is a squirrel cage motor with a tapped or multiple winding and a starter having sufficient switching points to connect for various pole groups, which incidentally must be multiples of each other. For instance, 4-pole, 1,800 rpm; 6-pole, 1,200 rpm; 8-pole, 900 rpm and 12-pole, 600 rpm could be the four speeds for one motor, any of these speeds giving equally efficient operations.

Sixty cycle power is nearly a universal blessing in the U. S. now that the major California conversion from 50 cycles is completed. But it seriously interferes with the top speed of motors. Two poles are the minimum for a motor and this means 3,600 rpm is the maximum for a 60-cycle motor. This is a handicap for some applications such as textile spindles and woodworking machines which demand higher speeds. Small single phase universal motors with commutator type armatures will run at higher speeds, but industrial applications generally step up the frequency of the power supply to those two-pole motors where 3,600 rpm is too slow. Small motor-generator sets will furnish, say 120 cycles power, which doubles the speed to 7,200 rpm.

Variable speed can be had in many other ways. There are d-c motors which can be so efficiently regulated by varying both the voltage supply to the armature and the current in the field that a-c power is sometimes converted to d-c just for such a motor, say on a paper machine. The power supply is generally an adjustable voltage a-c-d-c motor generator set, but for elaborate speed regulation the d-c power can be supplied instead by a mercury arc power rectifier whose voltage is subject to electronic control on its anode grids. The goal of all automatic controls or automatic regulators is to manipulate as large blocks of power as possible with the smallest amounts of energy. Accuracy, sensitivity and speed increase accordingly, and cost goes down. The mercury arc rectifier has these advantages to a marked degree.

Variable Speed with Constant Speed Motors

Some of the best solutions to variable speed requirements are not to use variable speed motors at all. Modern power plants, which must vary the flow of fuel, air, water and lubricants as the demand for power varies, are using reliable constant speed motors to run their auxiliaries and then adjusting speeds through magnetic clutches or hydraulic couplings. Going even further they are running fans and pumps at constant speeds, too, and regulating their discharge by dampers or by-pass valves.

It must be remembered however that magnetic couplings and hydraulic couplings hold no special charm as power savers. They are preferred for several things, such as: greater reliability derived with constant speed motors, simplicity of a coupling type speed control, self-cooling or rotating coupling, parts particularly good economy when used with a drive having fan

torque characteristics, and the opportunity to use synchronous motors to correct power factor.

Is a Hot Motor an Overloaded Motor?

Motor temperature is another problem. How hot is hot for a motor? Well, the usual general purpose motor is a 40 degree rise motor. What does this mean in operating temperature? It all starts out with the AIEE standards which say that cotton or other organic insulation is permitted to operate at a maximum temperature of 105 C at its hottest spot. But the hottest spot is not observable from outside the motor. So, a correction factor of 15 degrees is taken as the difference between the hottest internal spot and the cooler temperature observable on the motor's surface. Thus 90 degrees is the safe temperature measured by a thermometer on the motor. Since 90 C is equal to 194 F it can be realized that contacting it with the human skin is to be avoided.

In further explanation, a factor of safety of approximately 10 C is cut off this on open type motors so that about 80 C will be their full load operating temperature. The extra 10 degrees will not be used up unless the motor is run up to its 15 per cent overload Service Factor, which overload it can carry indefinitely at a safe cool 90 C—or a hot 194 F.

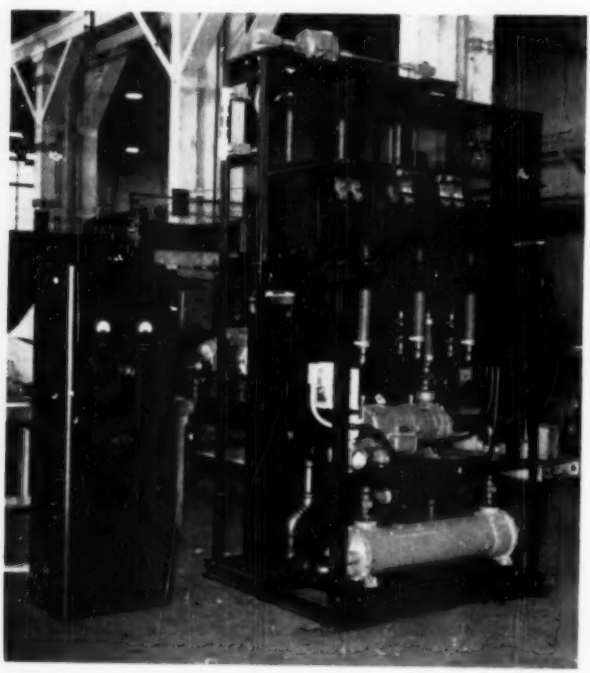
A 40 C rise motor means that it will radiate the heat created by its copper, core, and friction and windage losses fast enough so that it will not raise its temperature more than 40 degrees above its cold starting temperature, which would be the temperature of the surrounding air. Since the 40 degree rise motor is limited to a top temperature of 80 degrees, the starting temperature or ambient temperature must likewise be limited. In this case deducting 40 from 80 leaves an allowable room temperature of 40 C or 104 F. One reason so many motors seem to run cool even though fully loaded is that the ambient or air temperature is seldom this high, and the 40 degree temperature rise created by the wattage losses has simply started from a cooler datum.

The new insulations such as glass and silicones do not necessarily make better motors. It depends altogether on what advantages are taken from these new high temperature materials. The proposed AIEE Standard allows 180 C continuously for the hottest spot and 140 C maximum observable on the surface, compared to 90 degrees observable for cotton insulation. This advantage can be used to get more hp out of a motor, or to attain a smaller motor for the same horsepower, always a desirable trend in any power unit. And this is the use generally made of this advance in materials. These motors are designated as 100 degree rise motors. But at present this means a slight sacrifice in efficiency.

The high temperature life of glass, silicones, mica, asbestos, and similar inorganic materials which the AIEE has given the proposed designation of Class H Insulation, also makes them suited for constructing 40 degree rise motors which have to run in surrounding hotter than 40 C, or 104 F ambient. These ambient temperatures are, however, unusual. Such motors would usually be built on standard frame size without any saving in weight or space. These motors can create within themselves a normal 40 C rise above, say a 50 C room and still be under the hottest temperature allowable for a Class H winding.

Another use for glass and other Class H insulation, which is somewhat wasteful, is in the rewinding of a normal Class A or cotton insulated motor. The motor has been built liberal enough to create and dissipate only the quantity of heat which will raise its temperature 40 C above surroundings. The glass insulation is, therefore, never subjected to the higher temperatures for which it is made, unless, by some chance, it is placed in a spot that is already hotter than 104 F.

THIS 250-KW LIQUID RHEOSTAT FOR SPEED CONTROL IN ROTOR CIRCUIT OF LARGE SLIPRING MOTOR PROVIDES UNIFORM SPEED VERSUS RHEOSTAT POSITION WITHOUT RISK OF ELECTRODE FLASH-OVERS. STEPLESS SPEED CHANGES AND ELIMINATION OF CURRENT BREAKINC CONTACTS, PLUS EASE OF COOLING WITH WATER ARE AMONG ITS INHERENT ADVANTAGES.



Silicone Mold Release

THE WACO, TEXAS, DIVISION OF THE GENERAL TIRE AND RUBBER COMPANY USES A SILICONE MOLD RELEASE FLUID TO ASSURE EASY RELEASE AND GOOD SURFACE APPEARANCE IN MOLDING FARM SERVICE TIRES. MOLDS STAY CLEAN 5 TO 20 TIMES AS LONG BECAUSE THIS SILICONE RELEASE AGENT DOES NOT DECOMPOSE AT MOLDING TEMPERATURES TO FORM A CARBONACEOUS DEPOSIT ON THE MOLD. MOLD MAINTENANCE IS, THEREFORE, REDUCED TO A MINIMUM.

IN a previous issue of SP&I (Vol. 67, No. 2), detailed applicational data from seven Southern and Southwestern plants showed how silicone liquids, greases and compounds, resins and varnishes, and rubber-like solids, afforded savings in material and maintenance costs.

Here are several supplemental case histories relating to the use of a silicone mold release emulsion, which is milk white in color, unaffected by freezing, readily diluted with water, and non-corrosive to metals.

In addition to the three illustrated applications, production engineers of the Murray Rubber Company of Houston, Texas, advise that DC Mold Release Emulsion No. 35 is being used in their production of Neoprene electric cable boots used in oil well surveying equipment. Rapid flow of stock is imperative in molding these electric cable boots. The cavity between the long mold core and shell is less than ¼" wide and there are 9 thin walled collars to be filled. Easy release of these complicated moldings is equally important.

In this application, a dilute solution containing only 1 to 2 parts of Silicone emulsion to 100 parts of water is brushed on the mold cores.

The mold release agent readily wets metals to form a heat-stable silicone surface that improves the flow of hot rubber and imparts a high surface finish.

THE TEXAS RUBBER AND SPECIALTY CORP., OF HOUSTON, TEXAS, SPECIALIZES IN PARTS MOLDED OF NEOPRENE AND BUNA N FOR OIL WELL DRILLING AND PUMPING EQUIPMENT. DEEP CAVITY MOLDINGS SUCH AS THE RUBBER STEM PROTECTORS FOR OIL WELL DRILLS (LEFT) ARE UNLOADED FROM MOLDS SPRAYED WITH A DILUTE SOLUTION OF DC MOLD EMULSION NO. 35. AT THE RIGHT, "FEATHER FLEX" FLOOR MATS ARE REMOVED FROM SILICONE TREATED MOLDS WITH THE HIGH FINISH AND CLEAN PATTERN THAT GIVE ADDED SALES APPEAL TO THESE AUTOMOBILE AND FACTORY MATS MADE BY THE BETTER MONKEY GRIP COMPANY OF DALLAS, TEXAS.

Rx LUBRICATION

Part XII—Steam Engine Lubrication

By C. J. Copley and Will Risk

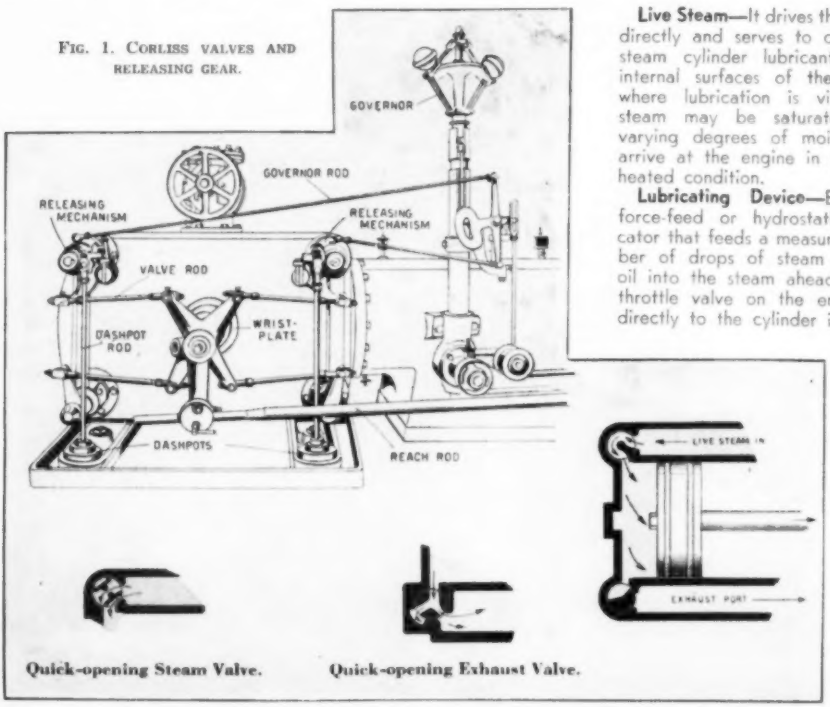
Although the steam engine is no longer king of the prime movers, it is still widely used in a variety of industries . . . . paper mills, food processing industries, chemical plants, mines, sawmills, woodworking plants, hospitals, ice plants, hotels, buildings, laundries etc., where steam must be available for other purposes.

Steam engines are a particularly good source of power when low pressure steam is needed for heating, drying or industrial processing. In such cases the engine is operated by the high pressure steam from the boiler, creates power for the operation of the plant, and then exhausts the steam at lower pressure for processing work.

BASIC ELEMENTS OF CONSTRUCTION

The purpose and principle of the steam engine is simple. It converts the heat energy of the steam into mechanical energy. To understand the part played by lubrication in the successful operation of such an engine, let's briefly review the principal elements involved:

FIG. 1. CORLISS VALVES AND RELEASING GEAR.



Live Steam—It drives the engine directly and serves to carry the steam cylinder lubricant to all internal surfaces of the engine where lubrication is vital. The steam may be saturated with varying degrees of moisture or arrive at the engine in a superheated condition.

Lubricating Device—Either a force-feed or hydrostatic lubricator that feeds a measured number of drops of steam cylinder oil into the steam ahead of the throttle valve on the engine or directly to the cylinder itself.

Inlet Valves—Their purpose is to allow a controlled amount of steam into the steam cylinder. See Fig. No. 1. The valves may be of the Corliss, slide, piston or poppet type. Once the required amount of steam has passed through the valve, the inlet valve closes.

A Cylinder—Here the steam is trapped by the valves and expands against the piston to drive it forward. Fig. No. 1.

Packing Gland—It seals the piston rod against leakage of steam from the cylinder while the piston rod travels in and out of the steam-filled cylinder. Fig. No. 2.

Exhaust Valves—They permit the timed escape of low pressure steam from the cylinder after each power stroke so that another cycle of action on the piston can take place. Fig. No. 1.

Oil Separator—A device for removing oil and water from the low pressure steam after it has been exhausted from the engine, but before the steam is returned to the boiler or used for processing.

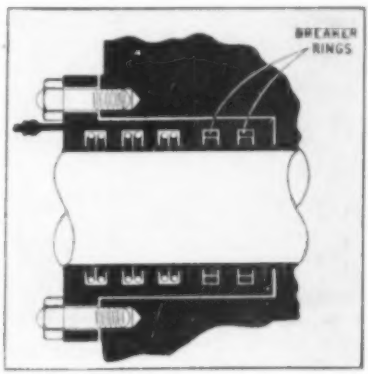
LUBRICATION PROBLEM

The basic steam engine lubrication problem is five-fold:

One—An oil must be selected which will provide lubrication for the valves, piston rings, cylinder walls and piston rod. It must form a lubricating film on these parts, adhere to their surfaces, make them slippery and prevent wear.

Two—The oil must be applied at the right place on the engine or in the steam line. Must be applied by an hydrostatic or force-feed lubricator. Must be fed through the lubricator in the proper amount.

Three—Because piston rods or valve stems move in and out of high temperature steam, the thin film on them is exposed to oxygen in the air. The cylinder oil used, therefore, must have exceptional stability to resist oxidation. Otherwise gummy or solid deposits result. Such deposits lead to excessive wear of packing or scoring of metal rods.



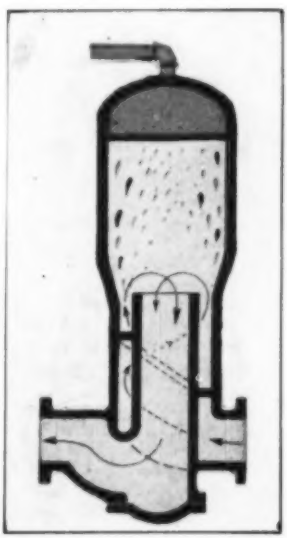


FIG. 2 (ABOVE) METALLIC PACKING IN STUFFING BOX. TWO INNER BREAKER RINGS RETARD INITIAL RUSH OF STEAM, AND PRESSURE IS REDUCED BY TIME STEAM REACHES FIRST SEALING RING. FIG. 3. (LOWER LEFT) SIDE VIEW OF STEAM SEPARATOR. STEAM ENTERS AT AN ANGLE AND TRAVELS IN A SPIRAL PATH. MOISTURE AND OIL ARE THROWN OUT BY CENTRIFUGAL FORCE.

Four—The cylinder oil must nearly always have emulsion-forming properties. Otherwise the oil on the internal surfaces of the engine will be washed away as effectively as a greasy surface of metal under a jet of steam.

Exceptions to this general rule are rare and only when the temperature of the steam is above 650 F.

Five—Lastly, the oil in the steam leaving the engine must separate readily from the exhaust steam in the separator. The separating ability of the oil is of course, not improved by the addition of the compounding materials originally put into the oil to improve its emulsifying properties in the first place. It is none-the-less true that oils having the highest lubricating properties in the cylinder can be more sparingly used and consequently require less removal by the separator. A typical separator is shown in Fig. No. 3.

LUBRICATION TROUBLES

The following list shows some of the common troubles occurring where steam engines are operated. Not all of these listed are due to oil. But the list does include those frequently attributed to the cylinder oil.

WEAR . . . mostly scuffed or scored cylinders but sometimes scored rods.

- Poor alignment of moving parts.
- Inadequate oil feed.
- Poor oil distribution.
- Weak oil film.
- Poor fitting of internal parts.
- Poor oil quality.
- Impurities in steam.
- Poor packing adjustment.
- Rust or corrosion due to air in cylinder after shutdown.

DEPOSITS . . . behind rings, at valves, at stuffing box.

- Impurities in steam.
- Unsuitable oil.

GROANING . . . a noise usually encountered during steady operation or while the engine is heavily loaded.

- Misalignment of moving parts due to temperature stresses.
- Improper oil feed.
- Poor oil distribution.
- Rusted surfaces if groaning occurs on starting.
- Weak oil film.

POOR OPERATION . . . which may or may not be evidenced by wear, groaning, deposits.

- Wear.
- Groaning.
- Deposits.
- Corrosion or rust.
- Warped valves.
- Poor valve seating.
- Lack of lubrication.
- Oil unsuitable for steam conditions.
- Engine adjustment.

LUBRICATION PRESCRIPTION

In the light of the typical troubles just mentioned, the "lubrication prescription" for the average steam cylinder is compounded of four essential considerations. The oil must be suitable for use under the influencing conditions of pressure, temperature, moisture and deposit-forming tendencies found at the steam engine.

While there is no fool-proof way of arriving at an exact "lubrication prescription", the following three rules will serve as a guide:

Rule 1—The temperature of the incoming steam is the most important factor in selecting the cylinder lubricant. With steam jacketed heads and cylinders, of course, temperatures within the cylinders, are correspondingly higher.

Steam temperature influences the selection of the oil for several reasons. First, it reduces the viscosity or thickness of the boundry film. Heat always thins oil. Second, when the oil is thinned, it adheres less to metal in the same way that molasses behaves on hot metal. Lastly, excessive steam temperatures due to superheating accelerate deposit formation on valve stems or .t packing glands.

Unless a properly selected oil is used, the temperature in the cylinder may be so high that the resultant thin film will lead to wear. In addition, the piston or valve sealing will be so low that the lubricant will be scoured away and metal surfaces left unprotected.

Rule 2—Steam pressure is also a consideration. The oil must possess enough film strength to resist destruction of lubricating seals between moving parts within the engine. Steam pressures are not as important or convenient a determining factor as is the steam temperature, however.

Rule 3—To resist the washing effect of moisture in the steam, use a compounded steam cylinder oil. Compounded oils combine with the water or moisture in the steam and form an emulsion which lubricates. Under wet conditions an ordinary mineral oil will not lubricate a steam cylinder unless fed in great quantities.

Summing up, the above mentioned requirements are best fulfilled by the selection of the highest quality steam cylinder oils made from highly filtered stocks and especially compounded for steam cylinder lubrication. In general, a high quality oil of 115" at 210 F. with 6 to 10% of compounding is suitable for cylinders operating on steam that is up to 350 F. A high quality oil of 160" at 210 F with 6% of compounding is suitable for temperatures 350 F. to 500 F. An oil of 210" at 210 F. with 5% compounding is used for temperatures of 500 to 650 F. For steam temperatures above 650 F., use a high quality non-compounded cylinder oil of 210" at 210 F. The foregoing description of the oil to be selected for specific conditions illustrates an important fact. As steam temperatures increase, heavier-bodied oils are required with descending compound content.

In the final analysis, however, the selection of the correct steam cylinder oil will not assure good operation of the engine. Careful operating practices are required. To emphasize a few points where good operation deals with good lubrication practice, see the following **operating notes**.

OPERATING NOTES

Cylinder Oil Feeds—With even the best steam cylinder oil in service, the amount of oil required for correct lubrication varies. Aside from mechanical condition of the engine, the amount of moisture or cleanliness and alkalinity of the steam from the boiler is an important influence.

If excessive moisture in the steam is due to foaming or priming, that condition requires correction before the steam reaches the engine. The same is true for highly alkaline steam which is a most effective agent in scouring the cylinder lubricant from the internal surfaces of the engine.

Be that as it may, the cylinder surface swept per pint of oil will serve as a yardstick for evaluating the amount of oil to be used. Feeds of 1,000,000 sq ft per pint of oil indicate the approximate amount of oil that should be used in the average engine operating on clean, moderately moist steam. With highly efficient operations, values of 3,000,000 sq ft per pint of oil may be obtained.

Where reductions in oil feeds are desirable, the best procedure is to make reductions gradually over a period of time in increments of not over 10% with the results checked by internal inspection of the cylinder.

Groaning of the Engine—Groaning is usually an indication of poor lubrication although misalignment or temperature stresses may be the source of trouble. If the trouble is lubrication, increased feeds should eliminate it.

Groaning of the engine on start-up, though, may be due to rusted surfaces or a poor lubricating film. Feed oil liberally just before shutdown so that better protective films of oil will remain on the metal surfaces while the engine is idle

Piston Blowby—Piston blowby is evidenced by high steam consumption and is normally caused by worn cylinders and worn or "miss-fitted" rings. Oil will not correct these mechanical difficulties.

Excessive Wear—Excessive wear of cylinders and rings is probably the result of poor engine alignment or sharp-edged rings. Lubrication will not solve such problems, either.

But, if the wear is in the form of scuffing—check oil feeds. They may be inadequate. Next consider steam conditions. Excessive moisture or alkalinity may be the scouring agent which is removing the lubricating film.

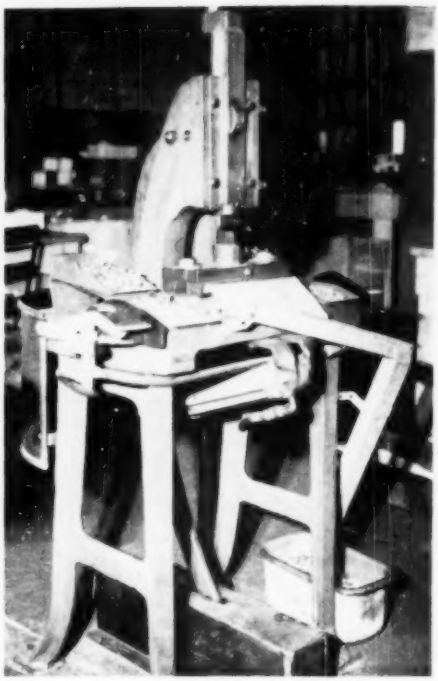
NOTE: The lubrication of steam engine bearings has not been discussed in this issue of the LUBRICATION NOTEBOOK. Plain bearing lubrication, into which class such bearings fall, has been previously discussed—Part II, Sept., 48, and Part III, Nov., 48.

For previous installments see July, Sept., Nov., 1948; Jan., Feb., Apr., July, Aug., Sept., Nov., and Dec., 1949

Making Old Machine Tools Safe

Hand work is exacting and requires concentration; automatic equipment is monotonous and tends to reduce alertness. In both cases, guards are needed for operator protection.

By Francis A. Westbrook



A "KICK" PRESS (FOOT-POWERED) CONVERTED SO THAT IT IS PNEUMATICALLY OPERATED AND HAS THE ADDED SAFETY FEATURE OF A TWO-HAND TRIP. NOTE ALSO THAT THE FOOT-OPERATED LEVER HAS BEEN ENCLOSED.

ONE of the most important items in bringing old machine tools up-to-date is to make them as safe as practicable. This need not be at all difficult because numerous safety appliances are available which may be attached to existing machines, and comparatively simple, inexpensive guards may be made in the plant maintenance shop.

According to the National Safety Council, the mechanical safeguarding of machines falls into two classes, namely, the application of guards at points of operation and around power transmission equipment. The former are usually more complicated and varied than the latter, and will be considered first.

PROTECTION AT POINT OF OPERATION

Safeguards of the following types may be used for the protection of operators at points of operation, as outlined by the National Safety Council: mechanical feeding and ejecting of the work; redesign of machine parts so that the operator cannot get into the danger zone; or to push or pull the operator's hands away from the danger zone; barricades, covers, hood guards, and other enclosures and interlocking devices.

While it is not practicable to go into details concerning the guarding of all types of machine tools a few specific cases will be covered which will indicate most of the general principles involved.

Punch Presses

Much has been done to reduce punch press accidents, and a brief description of the approach to this problem, and of the methods employed will be of practical interest.

In the first place, the method of feeding raw material into the press should be such that it will not be necessary for the operator to put either hand into the danger zone. Feed may be gravity, push, follow, magazine, dial, roll, hitch, transfer, reciprocating feeds, etc. The choice will of course depend on the shape of the part being made, the quantity of production called for, the type of power press and the design of the die.

Some means should be provided to remove finished work from the

dies by means other than manual, such as spring or rubber strippers, air blow-off, mechanical fingers, etc. Small pieces of scrap should also be removed mechanically by air or by chisel punches. Long pieces of scrap likely to be a tripping hazard should be cut up by a scrap cutter operated from the crankshaft. These pieces, if necessary may be blown into a scrap box if gravity flow is not practicable. Dies designed for use on inclined presses facilitate gravity ejection of stampings and scrap.

The height of stock gauges should be sufficient to prevent stock from slipping over them. Stock pins should be as high as practicable, and they should be beveled for easy feeding of the stock. Automatic stock pins which are operated by the ram may often be used to good advantage. To provide for proper locating of work with respect to the punch and dies, shaped or adjustable nesting plates should be installed so that the operator will not be required to hold parts in process, except strip stock, during the downstroke.

Feed tables of the same height as the die and long enough to support the stock are an aid in controlling the stock as it is being blanked, and positioning tables for stock boxes help to keep the material within easy reach of the operator. The lubrication of strip stock by means of a brush can be eliminated by having oiling rolls, or presses, and the punch and die can be lubricated with pressure guns.

Dies should be designed for standard die straps and die sets to prevent shifting with resultant damage. They should also be designed to provide for suitable guards, and if the press is already fitted with a guard any new dies must be designed so that they will be properly protected by the existing guards.

Two-hand controls are also frequently used where barrier guards are not practicable so that the press operator must have both hands in a safe place before the machine can function. Of course good housekeeping, adequate lighting according to the most up-to-date practices, plus localized lighting, and proper seating are of first importance wherever consideration is being given to safety measures.

Lathes

Where lathes are concerned the greatest accident hazards are due to the revolving stock or chuck and the lathe dog. Safety lathe dogs are available, so designed that there are no dangerous protruding parts. Guards to enclose a chuck or fixture holding work which is of unusual shape and liable to cause accidents are not difficult to make and should be provided.

As lathes are the most widely used of all machine tools, it will be worth while to consider safety precautions regarding them in some detail. This is especially desirable because many of these considerations apply to other machines. Thus all gears should be fully guarded so that the teeth are covered and, where the gear wheels have spokes, the sides should also be covered. Screens should be provided to protect persons working or passing near the lathes from flying chips.

It is also highly desirable to use mechanical hoists of some kind to place heavy work in the lathe, or other machine tool, so as to avoid injury or strain of the operator.

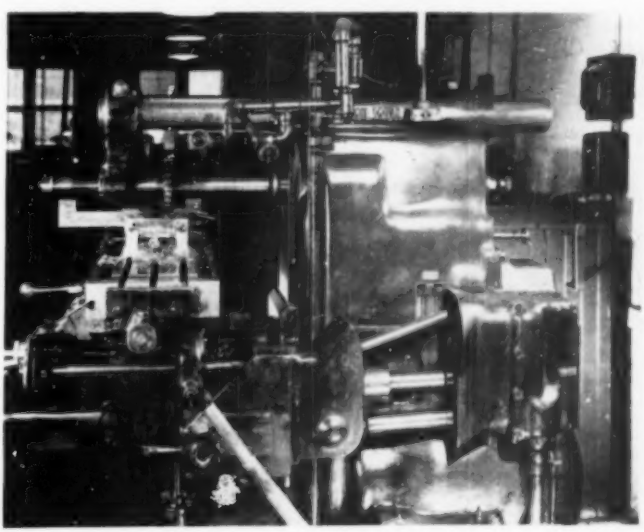
Automatic turret lathes and screw machines have many of the above hazards and also some peculiarly their own. The latter are mainly due to revolving stock which projects beyond the end of the machine and in which the clothing of operators or passers-by may become entangled. The provision of piping for the revolving stock is good protection and also prevents the stock from whipping, which might cause damage. When the stock projects beyond the end of the pipe, or if the pipe is not practicable for some reason, the area should be fenced off with guard rails.

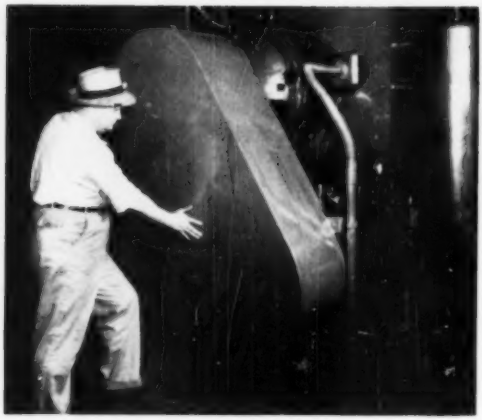
It is highly desirable to furnish screens to intercept flying chips and oil and it is advisable to sprinkle oil absorbing powder on the floor, or take other means to prevent accidents from slipping.

Drill Presses

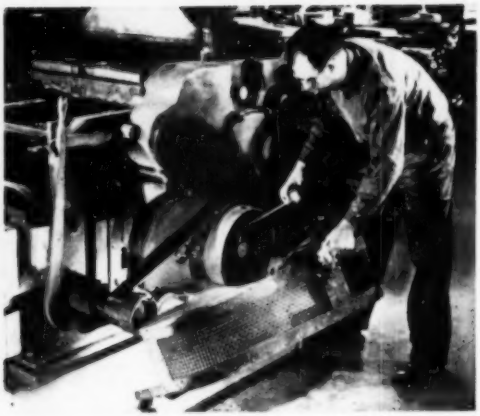
Drill presses should have revolving parts of spindles guarded to prevent operators' clothing or hair from becoming entangled. Exposed set screws on revolving parts are not to be tolerated, and all controls must be within easy reach. Holding small work by hand for drilling has resulted in many bad accidents and it is imperative that this be made unnecessary by providing jigs, stop

A MODERN GEAR-DRIVEN MILLING MACHINE WITH ALL GEARS ENCLOSED IN THE MAIN CASTING OF THE MACHINE.





COMPLETE PROTECTION IS GIVEN BY THE BUILT-ON GUARD. IT IS BOLTED TO THE FRAME OF THE MACHINE AND CAN BE EASILY REMOVED BY AUTHORIZED PERSONNEL.



NOTE THAT THE GUARD IS HINGED AT THE FLOOR TO PERMIT EASY ACCESS FOR OILING. THIS GUARD MAY BE LOCKED AGAINST THE FRAME OF THE MACHINE TO PREVENT REMOVING IT.

blocks, and vises to hold the work and keep it from turning with the drill. Guards to protect the operator from reamers and drills in the up position are very desirable. No attempt should ever be made to clean away any chips, etc. except with brushes provided for the purpose.

Milling Machines

Cutters on milling machines cause many accidents. Suitable guards for the cutters are desirable whenever practicable. When changing heavy cutters it is advantageous to place wooden blocks on the machine so that they will not have to be raised very far to slip them on to the arbor. It is also very desirable to provide chip guards of plastic or safety glass for the protection of operators and passers-by. A brush should always be used to remove chips from the work in the vicinity of the cutter, and then only when the machine is at rest.

Control levers and push button controls should be located within easy reach of the operator when at his usual station. Those types of milling machines having handwheels to adjust the table should have the wheel mounted on the shaft so that it will not revolve unless a clutch or ratchet is engaged. Thus when the machine is being automatically fed the handwheel need not turn and the danger of anybody being struck by the handle on the wheel is obviated. Or removable handles may be used which have a compression spring on the shank which will prevent its staying in place unless the operator holds it there.

Planers

Planers with openings under the planer table are very dangerous. They may hold tools or other objects which the operator is likely to reach for while the machine is in operation and many serious injuries have resulted. Consequently it is highly desirable to cover such openings with sheet iron, plywood or planks between the planer ways.

Counterweights and reverse dogs on each side of the planer bed should be guarded by sheet metal enclosures. Another important detail is that planers should be installed so that when the table is fully extended it will clear all fixed objects by at least 18 inches to prevent danger of crushing a passing person. A U-shaped guard made of pipe supported in friction bearings which the table expands as it travels provides a maximum of protection with a minimum of floor space.

Shapers

Shapers should have the rear end of the ram guarded similarly to planer tables, and have a clear space of at least 18 inches between the maximum stroke and any fixed object. Guards, to prevent chips striking passers and workers, and a stool for the operator should be provided.

Boring Mills and Slotters

Boring mills may have a sheet iron guard built around the table to protect the operator from being struck or caught by the revolving table or work, and to protect him from chips. Such guards should be hinged so that they may be opened easily for setting up work and for making adjustments and measurements. The counterweight should be guarded by encasing it to the floor level.

The counterweights of slotters sometimes cause accidents by the breaking of cast iron supporting arms, consequently steel arms should be used. The National Safety Council suggests that a chain be attached at one end to the counterweight and at the other end to the machine frame. It also favors guards and a counterweight box.

Saws and Grinders

Motor-driven band saws should have the push button controls located so that it is not necessary for the operator to reach past the saw to operate them. The wheels and band saw itself should be entirely enclosed, and an adjustable

guard should be provided and kept as close to the work as possible.

Friction saw hazards result mainly from flying sparks and, of course, from contact with the saw. Guards made of sheet metal strong enough to furnish protection against flying saw fragments, if the latter should break, are called for. Flying sparks may best be stopped and prevented from glancing off in different directions by leather baffles made of old belting. It is also desirable to install remote control so that the operator may remain at a safe distance.

Grinders used for tools or small parts should have safety glass shields with a plain glass cover to prevent pitting. The guard must be strong enough to provide protection in case the grinding wheel breaks. Particular care should be exercised to make it possible to have a tool rest that can be adjusted as the wheel wears down whereby it can be made to clear the surface of the wheel by no more than ⅛ inch. This prevents injuries due to the worker's hand being drawn in between the wheel and the tool rest.

Proper safety washers should be used. They greatly reduce the danger of wheel breakage by transferring centrifugal stress from the structure of the wheel to the metal washers in which it is securely clamped. The greater the diameter of the washers the greater their beneficial effect, especially in heavy grinding. Their diameter should be at least 60% of the diameter of the wheels up to 16 inches and 75% for larger wheels.

POWER TRANSMISSION EQUIPMENT

So far we have considered only the safeguarding of the points of operation of machine tools, and there remains the question of protection against injury by power transmission equipment. If not adequately guarded such equipment can be exceedingly dangerous, and has been the cause of innumerable serious accidents.

The several methods of driving machine tools call for various safety treatments. The drives of different machines vary considerably and must be guarded accordingly. For instance, with individual motor drives, the hazards due to belts can often be done away with almost entirely. In such cases, however, the motor frames and conduits should be grounded to avoid electrical hazards. In addition all live parts should be enclosed with grounded sheet metal shields.

Belts

When group or lineshaft drives are employed, accident hazards from belts are of course present and must be guarded against. Belts, gears, pulleys, silent chains, all projecting parts of drives, gear keys, clutches and all moving parts must be guarded. When suitable guards are not provided by the machine tool manufacturers, they must be installed by the user.

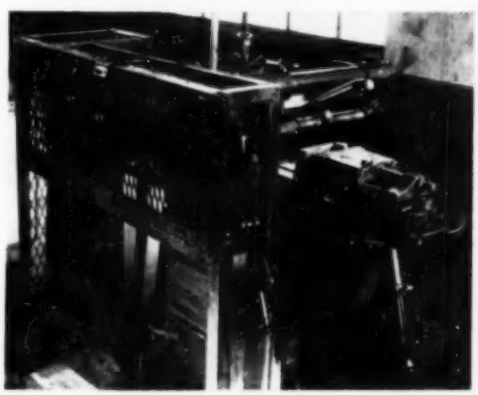
Mechanical belt shifters for use with cone pulleys as a substitute for manual shifting reduce accident hazards and also are more efficient where frequent shifting is called for. In those cases where hand shifting is necessary, the belts should either be endless or should be laced with rawhide, as metal fasteners are very likely to cause injuries.

Starters

Starting and stopping controls, whether belt shifters, clutches, switches, or push buttons should be provided for each machine individually. They should be of a type to prevent accidental starting of the machine and they should be easily accessible to the operator in

EFFECTIVENESS OF THE GUARD SHOWN AT RIGHT HAS BEEN REDUCED BECAUSE OF THE SECTION LEFT OPEN AT THE TOP TO PERMIT ACCESS TO THE OIL CUP. AN EXTENSION PIPE COULD EASILY HAVE BEEN ATTACHED TO THE OIL CUP.

THE WELL CONSTRUCTED GUARD, BELOW, COVERING THE DRIVE BELT AND WHEELS OF A MILLING MACHINE IS HINGED, PERMITTING ACCESS TO THE COVERED PARTS FOR OLING AND MAINTENANCE.



order that he may stop the machine instantly if he should get caught in it. On large lathes, boring mills, rolls and the like, where the operator may be caught in revolving parts of the machine or work, the placing of auxiliary emergency stop buttons or levers where he can hit them with any part of his body is highly advisable. They are convenient and economical to install and can be made to stop the machine almost instantly.

Guards, Etc.

Guards and safety devices of the type referred to should be made under the supervision of those conversant with up-to-date safety practices, and in accordance with the prescribed safety codes of the insurance company and the proper state authority. In one of its Safe Practices Pamphlets (No. 58) the National Safety Council gives some practical suggestions regarding the construction of guards for power transmission equipment which it is well worth while considering here very briefly. For details the pamphlet itself should be consulted.

A number of materials are used for guards, including wood, woven wire, perforated, expanded, sheet and cast metal, fiber board, etc. The accompanying installation photographs show several types of such guards.

Wooden guards are particularly suitable around electrical equipment because of the insulating characteristics of that material. It is also good for situations where the local conditions cause rapid deterioration of metal guards, but these conditions do not ordinarily apply to machine tool installations. Most wooden guards become shaky after a while as a result of shrinkage and other causes, and they are not as strong to withstand blows as may be desired when struck by a floor truck, or otherwise. Breakage of a belt may also splinter a wooden guard and if there is not sufficient clearance between belt and guard the friction between them is likely to produce sawdust which may become a fire hazard. Wooden guards themselves are also fire hazards. On the other hand strong wooden frames with metal filler, or wooden slats with pipe railings may be satisfactory.

Sheet metal has many advantages for guard construction, particularly where the power transmission parts operate in grease or oil baths, as is often the case with chains, sprockets, gears and especially where chains have teeth which mesh with gears. The metal enclosures should have gaskets at all joints to prevent leakage of lubricant and, if necessary, a drain can be provided in the guard to draw off excess oil or grease.

Sheet metal guards also exclude dust, dirt and grit and they are mechanically strong and stiff. Being complete enclosures such guards make it impossible for stock, or a workman's hand or finger, to get through to moving parts. Where used to protect belts, which it is desirable to keep them free from oil and grease, a clearance of no less than five inches between belt and guard should be provided.

Disadvantages of sheet metal guards of considerable size are that they interfere with light, are heavy and sometimes do not permit ready inspection of belt lacings and other details. Adequate provision must be made to support these guards, especially if the center of gravity is not squarely above the base.

Cast iron and cast aluminum guards are not generally used except by machine tools builders who have their own foundries. Consequently they need not be considered in connection with making old, unguarded machines safe by a purchaser who plans to install them for production purposes in his own plant.

Expanded and woven wire guards are much alike insofar as providing open work construction is concerned. They do not interfere with ventilation or obstruct light and make it possible to see the guarded moving parts. It is also possible to clean with compressed air when open work guards are used, or to play a fire extinguisher through the openings if there is a fire inside the guarded space. It is not difficult to make the frame and filler strong enough to withstand all ordinary service conditions for a reasonable length of time.

Guards made of perforated metal are much like those made of woven wire and of expanded metal. The open spaces are usually smaller and the strength is greater, making reinforcement rarely necessary. However the expense may also be greater.

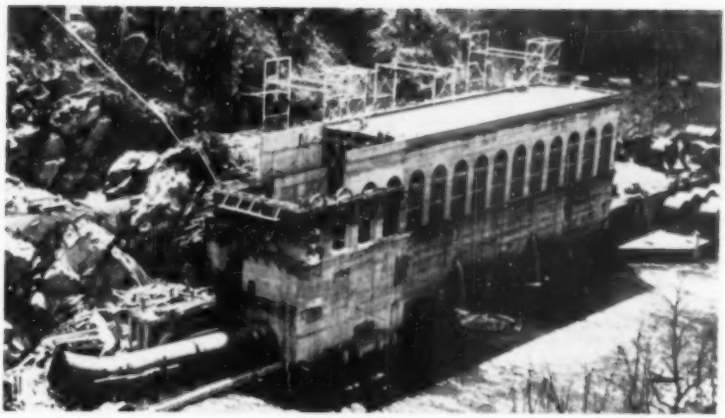
These pretty well cover the materials usually employed for machine tool power transmission equipment guards, but there are a few general details which should be considered. For example, the guarded parts must often be accessible for inspection and repairs and for those reasons the guards must have doors or sliding sections, preferably the former. If necessary there may be more than one door. The doors should be hinged for gravity closing so that they cannot be left open through carelessness, even if unlatched. All doors should have latches and there should be no projecting parts below the height of the tallest men which might be run into and constitute a hazard.

Lubrication

Grease cups or revolving parts are always a hazard and should be inside the guards. If they do not revolve but are within the guarded area it is frequently a simple matter to extend them through openings in the guard so that they can be filled from outside. Sometimes it is only necessary to leave an opening in the guard through which the spout of the oil can may be inserted.

Fastening Procedures

As a general thing bolts and nuts are less desirable than rivets in the fabrication of guards because of the tendency of nuts to work loose and because bolts and nuts project from the otherwise smooth surface of the guard, and are potential hazards themselves. Rivets may be hammered smooth and flat and are much less likely to work loose. Welding is sometimes resorted to with very satisfactory results as to economy and strength. Rough edges of woven wire, expanded or perforated metal guards should be covered where there is any danger of anybody coming in contact with them.



THIS VIEW TAKEN DURING CONSTRUCTION SHOWS THE POWER PLANT EXTENSION NEARING COMPLETION, AND THE PENSTOCK BEING PLACED.

Alcoa Subsidiary Expands Its Hydro Plant Near Tapoco, N. C.

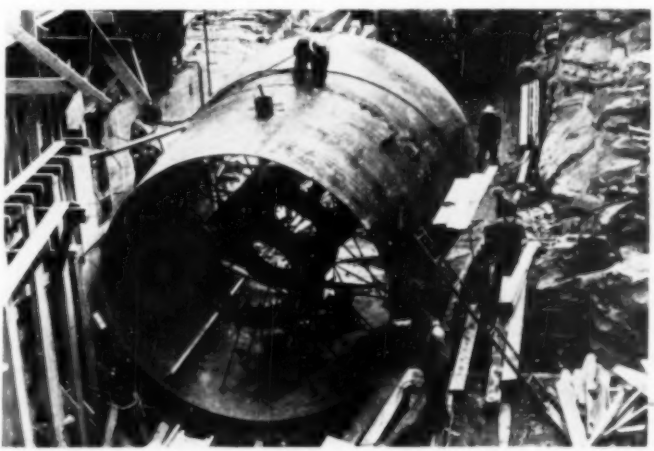
THE Cheoah Hydro-Electric Power Development, owned and operated by the Carolina Aluminum Company, a subsidiary of Aluminum Company of America, was recently expanded by addition of a fifth unit. The Development is located on the Little Tennessee River at Tapoco, North Carolina, in the Smoky Mountain area. The project makes a substantial and much needed contribution to the peak load generating capacity of the area's power system.

The daily flow of water at the Cheoah Development is now regulated almost entirely by the release of water from Fontana and Santeetlah reservoirs. Because of their large reservoir capacities, these two installations are usually operated as peak load plants. In order to properly fit the Cheoah Development into this system of water and power regulation, it was necessary to have more capacity in the Cheoah plant. The fifth new unit is larger than any of the four original units and increases the generating capacity of the plant by approximately 35 per cent.

The current expansion program consisted of extending the powerhouse and adding the fifth unit with its individual intake, penstock, switch yard and transformer equipment.

The new turbine is a vertical shaft, Francis type, rated at 40,000 hp at the point of best efficiency and 188 feet head. The scroll case is shop formed, field welded steel plate; no rivets were used. The construction of the entire turbine shows a marked trend toward steel fabrication instead of castings for this type of machine.

The new generator is a 37,500



WORKMEN ARE SEEN HERE FIELD WELDING A PENSTOCK SECTION.

MAJOR EQUIPMENT MANUFACTURERS FOR THE FIFTH UNIT OF THE CHEOAH HYDRO-ELECTRIC DEVELOPMENT

Turbine	Allis-Chalmers Mfg. Co.
Generator	Allis-Chalmers Mfg. Co.
Switchboard	Westinghouse Electric Corp.
Transformers	Moloney Electric Co.
Switch Yard Equipment	Railway & Industrial Engineering Co.
Penstock	Chicago Bridge & Iron Co.

kva, 80 per cent power factor, 6,900 volt, 3 phase, 60 cycle, 164 rpm unit. The rotor has a WR^2 of 14,500,000 and is mounted on a Kingsbury spherical thrust bearing. The generator and turbine are connected by a one-piece shaft. Because of their size and weight, the generator stator was stacked and wound in place and the rotor was assembled at the job site.

The penstock, 17 feet in diameter and 490 feet in length, is constructed of butt welded steel plates. The shell is designed for 12,500 psi in ring tension, 1/16 inch corrosion allowance, 100 per cent joint efficiency, and a minimum thickness of ½ inch. A maximum thickness of ⅞ inch was required after allowance for water hammer had been added to static pressure. Since the penstock sections were too large in diameter for transportation, formed plate was shipped to the job and field welded.

The sections of the penstock were brought up the river by barge. They were then hauled by roadway to the top of the dam, and lowered into place on a skidway by means of the stiff leg derrick which is a permanent installation at the end of the dam.

The new penstock and intake are entirely independent of the existing installation and may be operated during periods when it is necessary or desirable to unwater the original system.

The new switch yard is also independent and may be operated when the original switch yard is not in operation. Three single phase, 12,500 kva, oil insulated, self-cooled transformers are provided. The low voltage from the generator bus is 6,000. The high voltage is 165,000 with two voltage taps above and two below normal.

The excavation consisted of about 9,000 cubic yards of very hard, arkose rock. Light charges of explosive were used since about half of the excavation took place within 60 feet of a generator in operation.

The construction work was done by the Harrison Construction Company of Pittsburgh, Pennsylvania, and Maryville, Tennessee. The design and construction of the project was under the direction of J. P. Growdon, Chief Hydraulic Engineer, Aluminum Company of America.

Conveyor Belt Supplants Railroad Engines

A four-flight conveyor belt, designed by mechanical goods engineers of Goodyear Tire & Rubber Co., is moving a limestone mountain at the rate of 350 tons per hour in the heart of Virginia's scenic Blue Ridge country.

The belt system transports crushed limestone from the quarry of the Blue Ridge Stone Corp., near Roanoke, on a three-quarter mile haul to the processing plant.

A permanent installation, the belt conveyor replaces six dinkey railroad engines which for years struggled up a six per cent grade with loaded cars, requiring six miles of track.

First three flights of the "rubber railroad" hauls stone to the stockpile. The fourth flight delivers from the stockpile to the plant.

Tail end of the No. 1 belt tunnels under the quarry floor to receive 10-in. lumps from the primary crusher, then lifts 57 ft to the secondary crusher. Here the load transfers to the second belt, which travels 1,300 ft, spans a work road, and elevates 55 feet to the quarry rim to discharge onto Flight No. 3. The third belt negotiates a highway underpass before swinging upward on a 1,025 ft radius to unload on a 70 ft high stockpile.

The last belt, Flight No. 4, tunnels under the stockpile to receive its load from a remote-controlled feeder gate, and runs 1,600 ft to the finishing plant.

The primary belt is 42 inches wide, the three others 30 inches. The system is powered by three 50 and one 40 horsepower motors. Idlers, structure and machinery for the system were supplied by the Barber-Greene Co.

AFTER BEING LIFTED 57 FT FROM THE QUARRY FLOOR TO A SECONDARY CRUSHER, LIMESTONE IS TRANSFERRED TO THIS BELT, WHICH TRAVELS 1,300 FT, SPANS A WORK ROAD, AND ELEVATES 55 FT TO THE QUARRY RIM TO DISCHARGE ONTO A THIRD BELT AT THE RATE OF 350 TONS AN HOUR.

Southwest Air Conditioning Show

Exposition, to be held under the auspices of A.S.H.V.E. in Dallas, Texas, January 23-27, will reflect new trends in structural design.

New trends in structural design will be included among the many disclosures at the forthcoming SOUTHWEST AIR CONDITIONING EXPOSITION at Dallas, Texas. The exposition, under the auspices of the American Society of Heating and Ventilating Engineers, will be held from January 23 to 27 at State Fair Park. It has enrolled approximately 200 displays by manufacturers of every type of equipment used in heating, ventilating and air conditioning buildings of every kind and for all purposes. More forcibly than at any previous exposition of its kind, exhibits will reflect the result of air conditioning design on the construction industry.

Glimpses of exhibitors' plans for the exposition reveal numerous examples of the influence of research in air conditioning, heating and ventilating on building design. In one instance light-weight steel building panels, only three and one-quarter inches thick, when used for exterior walls, are said to have a heat transmission factor superior to a twelve-inch masonry wall with furred plaster interior surface. Protected by asbestos coatings, such panels are used for roofing as well as side walls; structural sub-floors are also carried out in the same line of development. Then there are Thermopane insulating glass, "heat absorbing" plate glass and Golden plate glass for show windows, to reduce fading from sunlight. At another booth glass building blocks and foamglass insulation will be demonstrated in their relation to air conditioning design.

Latest details for properly insulating various parts of air conditioning systems by means of corkboard, cork covering and mineral wool board will be featured by still another exhibitor. Also in the same class of displays will be one featuring prefabricated insulation for piping and ducts, especially in the construction of industrial plants, housing groups, airports and railroad terminals.

Modifications of design for interiors are suggested by the influx of displays such as one featuring radiant panels and baseboards. Another manufacturer in the same line is offering a range of materials in special fin tube designs, including steel, copper and aluminum in various combinations, with covers designed for functional as well as decorative appeal.

A triple service hot water system, especially designed for low-cost housing projects is adaptable for either radiant panel or convector design. By contrast with equipment tending to influence architectural design, the manufacturer of this system is also offering another, a winter air conditioner, "which is factory adjusted to provide comfort level heating superior to older methods of warm air heating, which can be located anywhere —closet, kitchen, attic, garage or basement."

Units Widely Adaptable

An important note, repeated at many of the exhibits, is the wide adaptability of many of the units to fit the requirements of existing structures or the fixed needs of standard construction in conventional buildings. The one-room air conditioning unit affords one illustration. Another is the furniture-styled room heater, such as one exhibitor is offering along with a new line of gas-fired floor furnaces in four models. All four of these will be available in floor and dual-wall register styles. In another line, consisting of stubby floor furnaces and narrow wall heaters, both single and dual units are offered in a range of 25,000 to 45,000 Btu input, which are designed to fit a standard four-inch wall with 16-inch studding. Considerable adaptability is also shown by a line of gas-fired steam radiators and unit heaters, the basic feature of which is a one-piece heat exchanger casting.

Greater flexibility of installation than ever before offered is claimed by the manufacturer of a new type of forced air furnace, said to be not only compact, but so quiet that these units may be set up anywhere, even in the living area. A unique type of gravity heater runs from floor to ceiling and is but 10⅜ inches wide, depending on the heating capacity required.

Among first-time displays at the exposition will be a gas burner that brings to the field of forced draft conversion burners high capacities with minimum size and lower gas pressures. An electronic safeguard system and automatic combustion controls are features of this unit.

There is also a brand new 30-horsepower condensing unit incorporating automatic capacity reduction, and—by the same exhibitor—three new sizes of packaged air conditioning units, at two, three and seven and one-half tons capacity, with new, quiet, vibration-free compressors. A "dry fan" evaporative condenser, which another manufacturer has ready for the exposition, operates on the principle of forcing dry air through the unit, instead of exhausting wet air through the fan.

The largest packaged air conditioning unit reported thus far among equipment items to be shown at Dallas is a 25-ton machine having the evaporative condenser built as a part of the unit; all mounted on a single channel iron base and completely paneled.

Packaged Boilers on View

Instancing the great variety of equipment that is being brought to the scene, there is the packaged steam boiler, which comes with all auxiliaries and controls mounted on a single base, ready to set down, connect up and run. One manufacturer in this line is offering a range of eighteen sizes from ten to 400 horsepower and operating at 15 to 200 pounds pressure.

A large number of exhibits will display units and devices for modifying or improving the performance of existing equipment of various kinds. For instance, there is an ingenious variable speed blower drive for forced-air furnaces and conversions, in which a "sample" of air is constantly drawn by the fan from the bonnet of the heater and blown over a thermostatic bellows, the movement

of which alters the diameter of the fan driving pulley. As the furnace temperature rises the speed of the fan is increased, due to the change in diameter of the pulley, thus accelerating the warm air circulation. After the room thermostat cuts out, the blower slows down gradually as the furnace cools. It is claimed that the variable-speed blower operation produces a more even heat flow than does the conventional fixed speed blower operation.

The newest type of replaceable air filter is a glass mat produced by a process originally developed for separators for dry charged storage batteries. This type of mat has a controllable dispersion of long fibers, largely in parallel, forming a patterned arrangement and formulated with an adhesive plastic binder. The same material, differently formulated, is used as an insulating pipe covering.

For oil filtration, the latest development is a new type wool felt cartridge which is said to increase the flow rate and eliminate lints. The cartridge consists of a stack of felt discs surrounding a tubular screen core through which the oil is filtered radially. Both inlet and outlet are at the top of the filter.

Electric motors constitute a rather impressive group of exhibits and include a number of innovations that are noteworthy. In one display a motor will be shown that has been specially developed for the air conditioning industry and is designed to run in an atmosphere of freon gas. At the same exhibit will be a splash-proof motor, an all-weather type which may be washed down with a hose and which will withstand any adverse weather conditions. A third type is an a-c variable speed drive with a stepless speed control.

Partial List of Exhibitors

SOUTHWEST AIR CONDITIONING EXPOSITION

Dallas, Texas—January 23-27, 1950

—A—

A-J Manufacturing Co., 2119 Washington St., Kansas City 8, Mo.
Acme Industries, Inc., Jackson, Mich.
Aetna Industrial Corporation, Trimont Manufacturing Co., Division 55 Amory St., Roxbury 19, (Boston) Mass.
Air Devices, Inc., 17 E. 42nd St., New York 17, N. Y.
Air-Maze Corporation, 5200 Harvard Ave., Cleveland 5, Ohio.
Airtemp Division—Chrysler Corporation, 1600 Webster St., Dayton 1, Ohio.
Aldrich Company, Wyoming, Ill.
Allan Engineering Co., P. O. Box 1211, Dallas 1, Texas.
Allis-Chalmers Manufacturing Company, P. O. Box 512, Milwaukee 1, Wisc.
Allis Co., The Louis, 427 E. Stewart St., Milwaukee 7, Wisc.
Alton Manufacturing Company, 1112 Ross Ave., Dallas 2, Texas.
Aluminum Company of America, 801 Gulf Bldg. Pittsburgh 19,
American Air Filter Company, Inc., 1st & Central Aves., Louisville 8, Ky.
American Artisan, 6 N. Michigan Ave., Chicago 2, Ill.
American Coolair Corporation, Jacksonville 3, Florida.
American Gas Association, Inc., 420 Lexington Ave., New York 17, N. Y.
American Radiator & Standard Sanitary Corporation, P. O. Box 1226 Bessemer Bldg. Pittsburgh 30, Pa.
American Sheet Metal Company, 601 First Ave., Dallas, Texas.
American Society of Heating and Ventilating Engineers, The, 51 Madison Ave., New York 10, N. Y.
Ames Iron Works, Ames Bldg. Oswego, N. Y.
Anemostat Corporation of America, 10 E. 39th St., New York 16, N. Y.
Armstrong Cork Company, Building Materials Division, Lancaster, Pa.
Armstrong Machine Works, Three Rivers, Mich.
Armstrong Products Corporation, Huntington 12, W. Va
Armstrong Steam Trap Company, Three Rivers, Mich.
Automatic Firing Corporation, 6504 Olive Blvd., St. Louis 5, Mo.
Automatic Products Company, 2540 N. 32nd St., Milwaukee 10, Wisconsin.

—B—

Baker Refrigeration Corporation, South Windham, Maine.
Baltimore Aircoil Company, Inc., 715 W. Pratt St., Baltimore 1, Md.
Barber-Colman Company, 229 Loomis St., Rockford, Ill.
Bar-Brook Manufacturing Co., Inc., 6133 Linwood Ave., Shreveport, La.
Bauer & Black, Division of The Kendall Company, 2500 S. Dearborn St., Chicago 16, Ill.
Bell & Gossett Company, Morton Grove, Ill.
Black & Decker Mfg. Co., The, Towson 4, Md.
Bronson Manufacturing Company, 1237 Riverside Drive, Los Angeles 31, Calif.
Bryant Heater Division, Affiliated Gas Equipment Inc., 17825 St. Clair Ave., Cleveland 10, Ohio.
Bundy Tubing Company, 8109 E. Jefferson Ave., Detroit, Mich.

—C—

Carrier Corporation, 302 S. Geddes St., Syracuse 1, N. Y.
Century Electric Company, 1806 Pine St., St. Louis 3, Mo.
Char-Gale Manufacturing Company, Minneapolis 6, Minn.
Chemical Engineering Company, 2800 Logan St., Dallas, Texas.
Chrysler Corporation—Airtemp Division, 1600 Webster St., Dayton 1, Ohio.
Climax Machinery Company, 301 S. LaSalle St., Indianapolis 6, Ind.
Clow & Sons, James B., 201 N. Talman Ave., P. O. Box 6600 A, Chicago 80, Ill.
Coleman Company, Inc., The, Wichita 1, Kansas.
Combustion Control Corporation, 77 Broadway, Cambridge 42, Mass.
Comfort Products Corporation, 2220 S. Lamesa, Dallas 2, Texas.
Commercial Filters Corporation, 18 W. Third St., Boston 27, Mass.
Congress Drives Division—Tann Corporation, 3750 E. Outer Drive, Detroit 34, Michigan.
Connor Engineering Corporation, W. B., 114 E. 32nd St., New York 16, N. Y.
Continental Air Filters, Inc., P. O. Box 1647, Louisville 1, Ky.
Crane Co., 836 S. Michigan Ave., Chicago 5, Ill.
Curtis Refrigerating Machine Division, Curtis Manufacturing Company, 1905 Kienlen Ave., St. Louis 20, Mo.
Cyclotherm Corporation, 90 Broad St., New York 4, N. Y.
Home Office Oswego, N. Y.

—D—

Day & Night Division—Affiliated Gas Equipment, Inc., Monrovia, Calif.
Dearborn Stove Company, 1700 W. Commerce St., P. O. Box 5527, Dallas, Texas.
Detroit Lubricator Company, 5900 Trumbull Ave., Detroit 8, Mich.
Devices, Inc., 280 Madison Ave., New York 16, N. Y.
Dewey-Shepard Boiler Company, 1311 N. Capitol Ave., Indianapolis 2, Ind.
Dodge Corporation, F. W., 119 W. 40th St., New York 18, N. Y.
Dole Valve Company, The, 1933 Carroll Ave., Chicago 12, Ill.
Dole Refrigerating Company, 5910 N. Pulaski Road, Chicago 30, Ill.
Dollinger Corporation, Rochester 3, N. Y.
Domestic Engineering Company, 1801 Prairie Ave., Chicago 16, Ill.
Domestic Engineering Magazine, 1801 Prairie Ave., Chicago 16, Ill.
Domestic Engineering Catalog Directory, 1900 Prairie Ave., Chicago 16, Ill.
Dovis Vacuum Cleaner Company, 225 Stevens St. S.W., Grand Rapids 7, Mich.
Duo-Therm Division, Motor Wheel Corporation, Lansing 3, Mich.
Dwyer Mfg. Company, F. W., 317 S. Western Ave., Chicago 12, Ill.
Durant Insulated Pipe Company, P. O. Box 88, 1015 Runnymede St. East Palo Alto, Calif.

—F—

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.
Farr Company, 2615 Southwest Drive, Los Angeles 43, Calif.
Fasco Industries, Inc., P. O. Box 509, Rochester 2, N. Y.
Forney Engineering Company, 2705 Hawes St., Dallas 9, Texas.
Fedders-Quigan Corporation, Buffalo 7, N. Y.
Frick Company, Waynesboro, Pa.
Frigidaire Division—General Motors Corporation, Dayton 1, Ohio.

(Continued on next page)

—G—

Gannon Company, Russell R., 700 Dixie Terminal Bldg. Cincinnati 2, Ohio.
General Controls Company, 801 Allen St., Glendale, Calif.
General Electric Company, Air Conditioning Dept., 5 Lawrence St., Bloomfield, N. J.
General Filters, Inc., 12890 Westwood Ave., Detroit 23, Mich.
Glasfloss Corporation, 155 E. 44th St., New York 17, N. Y.
Gold Top Heating, Inc., 1400 E. Second St., Butte, Montana.
Goodfellow Company, Inc., E. D., 346 N. Front at Jackson, Memphis Tenn.
Governair Corporation, 513 N. Blackwelder, Oklahoma City 1, Okla.
Greenlee Tool Co., Rockford, Ill.
Gustin-Bacon Manufacturing Company, 1416 W. 12th St. Kansas City, Mo.

—H—

Heating, Piping and Air Conditioning, 6 N. Michigan Ave., Chicago 2, Ill.
Heating and Ventilating, 148 Lafayette St., New York 13, N. Y.
Herman Nelson Corporation, The, Moline, Illinois.
Hunter Fan and Ventilating Company, Inc., P. O. Drawer 2858, Memphis 2, Tenn.
Holly Manufacturing Company, 875 S. Arroyo Parkway, Pasadena 2, Calif.

—I—

Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago 10, Ill.
Imperial Brass Manufacturing Company, 1200 West Harrison St., Chicago 7, Ill.
Industrial Press, The, 148 Lafayette St., New York 13, N. Y.
Ingersoll-Rand Company, 11 Broadway, New York 4, N. Y.
International Manufacturing Co., Air Conditioning Division, Oklahoma City, Oklahoma.
International Metal Products Co., Phoenix, Arizona.
Iron Fireman Corporation, 6504 Olive Blvd., St. Louis 5, Mo.

—J—

Jefferson Electric Company, Bellwood, Ill.
Jenkins Bros., 80 White St. New York 13, N. Y.
Johnson Service Company, 507 E. Michigan St., Milwaukee, Wisc.
Joy Manufacturing Company, Henry W. Oliver Bldg., Pittsburgh 22, Pa.

—K—

Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill.
Kennard Corporation, 1819 S. Hanley Road, St. Louis 17, Mo.
Kendall Company, The, Bauer & Black Division, 2500 S. Dearborn St., Chicago 16, Ill.
Kewanee Boiler Corporation, Kewanee, Ill.
Kritzer Radiant Coils, Inc., 2901 Lawrence Ave., Chicago 25, Ill.

—L—

Lewin-Mathes Company, 1111 Choteau Ave., St. Louis 2, Mo.
Libbey-Owens-Ford Glass Company, Toledo 3, Ohio.
Lilie-Hoffmann Cooling Towers, Inc., 4239 Duncan Ave., St. Louis 10, Mo.
Little Giant Vaporizer Co., Inc., 5105 Classen Blvd., P. O. Box 3535, Oklahoma City 6, Okla.
Lockformar Company, The, 4615 W. Roosevelt Road, Chicago 50, Ill.
Lone Star Gas Company, 301 S. Harwood St., Dallas 1, Texas.

—M—

Marley Company, The, Fairfax & Marley Roads, Kansas City 15, Kansas.
Marlo Coil Company, 6135 Manchester Ave., St. Louis 10, Mo.
McDonnell & Miller, Inc., Wrigley Bldg., Chicago 11, Ill.
Mid-Continent Metal rPoducts Co., 1906 N. Clybourn Ave., Chicago 14, Il.
Midwest Air Control, Midwest Automatic Control Co., 510 Third St., Des Moines, Iowa.
Milwaukee Gas Specialty Company, 730 N. Jackson St., P. O. Box 461, Milwaukee 1, Wisc.
Minneapolis-Honeywell Regulator Company, Minneapolis 8, Minn.
Mitchell Manufacturing Company, 2525 Clybourn Ave., Chicago 14, Ill.
Morse-Smith-Morse, Inc., 165 Dexter Ave., Watertown 72, Mass.
Motor Wheel Corporation, Duo-Therm Division, Lansing 3, Mich.
Mueller Furnace Company, L. J. 2005 W. Oklahoma Ave., Milwaukee 7, Wisc.
Multi-Vent Division, The Pyle-National Company, 1367 E. 37th St., Chicago 9, Ill.
Mundet Cork Corporation, 7101 Tonelle Ave., North Bergen, N. J.

—N—

Nesbitt, Inc., John J., Holmesburg, Philadelphia 36, Pa.
Niagara Blower Company, 405 Lexington Ave., New York 17, N. Y.
Norman Products Company, 1150 Chesapeake Ave., Columbus 8, Ohio.

—O—

Ohio Foundry and Manufacturing Company, Penn R. R. & Slack St., Steubenville, Ohio.
Oran Company 2232 S. Third St., Columbus 7, Ohio.
Outside Venetian Blind Company, 2526 Elm St., Dallas 1, Texas.
Owens-Corning Fiberglas Corporation, 1833 Nicholas Bldg., Toledo 1, Ohio.

—P—

Pacific Boiler Division—United States Radiator Corporation Detroit 31, Mich.
Palmer Manufacturing Corporation, Phoenix, Arizona.
Patterson-Kelley Co., Inc., The, East Stroudsburg, Pa.
Payne Furnace Division—Affiliated Gas Equipment, Inc., 336 N. Foothill Road, Beverly Hills, Calif.
Pennsylvania Furnace & Iron Co., Warren, Pa.
Pittsburgh Corning Corporation, 632 Duquesne Way Pittsburgh 22, Pa.
Plumbing and Heating Journal, 45 W. 45th St., New York 19, N. Y.
Plumbing and Heating Wholesaler, 45 W. 45th St. New York 19, N. Y.
Polaire Cooler Co. Inc., 141 E. Jackson St., Phoenix, Arizona.
Powers Regulator Company, The, 2720 Greenview Ave., Chicago, Ill.
Prat-Daniel Corporation, Thermobloc Division, East Port Chester, Conn.
Pyle-National Company, The Multi-Vent Division, 1367 E. 37th St., Chicago 9, Ill.

—Q—

Quiet-Heet Mfg. Corp., 135 N. J. Railroad Ave., Newark, N. J.

—R—

R C S Tool Sales Corporation, P. O. Box 1434, Joliet, Ill.
Radiant Utilities Corp., 8817 - 18th Ave., Brooklyn 14, N. Y.
Ralph Supply, Inc., P. O. Box 188, Wadsworth, Ohio.
Randall Graphite Bearings, Inc., 609 W. Lake St., Chicago 6, Ill.
Ray Oil Burner Co., 401 Bernal Ave., San Francisco 12, Calif.
Ready-Power Co., The, 76 W. Adams Ave., Detroit 26, Mich.
Redmond Company, Inc., Owosso, Mich.
Refrigeration Appliances, Inc., 923 W. Lake St., Chicago 7, Ill.
Refrigeration Engineering, Inc., 7250 E. Sisuson Ave., Los Angeles, Calif.
Research Products Corporation 1015 E. Washington Aves., Madison 3, Wisc.
Reynolds Metals Company, 2000 S. Ninth St., Louisville 1, Ky.
Ric-wil, Company, The, 1052 Union Commerce Bldg., Cleveland 14, Ohio.
Ridge Tool Company, The, Elyria, Ohio.
Robertson Company, H. H., Farmers Bank Bldg., Pittsburgh, Pa.
Royal Heaters, Inc., 1024 Westminster Ave., Alhambra, Calif.

—S—

Sarco Company, Inc., Empire State Bldg., New York, 1, N. Y.
Servel, Inc., Evansville 20, Ind.
Sheet Metal Worker, 45 W. 45th St., New York 19, N. Y.
Siemon & Company, 3025 Main St., Kansas City 8, Mo.
Skidmore Corporation, St. Joseph, Mich.
Smith Corporation, A. O., Milwaukee, Wisc.
Southland Supply Company, Inc., 2034 Amelia St., Dallas 9, Texas.
Stewart Warner Corporation 1514 Drover St., Indianapolis 7, Ind.
Sundstrand Machine Tool Co., Rockford, Ill.
Surface Combustion Corporation, Toledo 1, Ohio.

—T—

Tol Bender, Inc., Milwaukee 2, Wisc.
Tann Corporation—Congress Drives Division, 3750 E. Outer Drive, Detroit 34, Mich.
Tennessee Enameling Manufacturing Co., Nashville 9, Tenn.
Texas Lawn Sprinkler Co., Inc., 5422 Redfield St., Dallas, Texas.
Thermobloc Division Prat-Daniel Corporation, East Port Chester, Conn.
Titus Manufacturing Corporation, P. O. Box 591, Waterloo, Iowa.
Torrington Manufacturing Company, The, 70 Franklin St., Torrington, Conn.
Trimont Manufacturing Co., Division of Aetna Industrial Corporation, 55 Amory St., Roxbury 19, (Boston) Mass.
Tuttle & Bailey, Incorporated, New Britain, Conn.
Typhoon Air Conditioning Co., Inc., 794 Union St., Brooklyn 15, N. Y.

—U—

United Electric Service Co., P. O. Box 109, Wichita Falls, Texas.
United States Air Conditioning Corporation, Como Ave., S. E. at 33rd St., Minneapolis 14, Minn.
United States Radiator Corporation, Detroit 31, Mich.
United States Radiator Corporation, Pacific Steel Boiler Division, Detroit 31, Mich.
Utility Appliance Corp., 4851 S. Alameda St., Los Angeles, Calif.

—V—

Vernon Manufacturing Company, The, Holmes St. & Ledbetter Drive, Dallas 8, Texas.
Viking Manufacturing Company, The, 1747 Chester Ave., Cleveland 14, Ohio.
Viking Supply Company, 2625 Elm St., Dallas 1, Texas.
Visor Corporation, 2625 Elm St., Dallas 1, Texas.
Vulcan Radiator Company, The, 26 Francis St., Hartford 6, Conn.

—W—

Waterman-Waterbury Company, The, 1121 Jackson St., N. E. Minneapolis 13, Minn.
Webster Electric Company, Clark & Dekoven Sts., Racine, Wisc.
Webster Engineering Company, The, Tulsa, Oklahoma.
Weil-McLain Company, Michigan City, Ind.
Westinghouse Electric Corporation, 511 Wood St., P. O. Box 868 Pittsburgh 30, Pa.
Wheeling Furnace Corporation, 2nd & Jefferson Sts., Martins Ferry, Ohio.
White-Rodgers Electric Company, 1209 Cass Ave., St. Louis 6, Mo.
Worthington Pump & Machinery Corporation, Harrison, N. J.

—Y—

Yarnall-Waring Company, Chestnut Hill, Philadelphia 81, Pa.
York Corporation, York, Pa.

—Z—

Zink Company, John, P. O. Box 310, Tulsa 1, Oklahoma.
Zone Heat Regulator Co., Box 188, Garrettsville, Ohio.

How To Apply "Color Power" In The Power Plant

By James A. Meacham

The Sherwin-Williams Co.

The magic of color is going to work in the power plant. More than ever before management is realizing that this is one way to get the most out of the plant painting job.

WHEN color is skillfully used, paint not only serves its primary purpose of protecting surfaces and beautifying but also confers definite psychological benefits which are reflected in improved employee relations, better housekeeping and generally increased plant efficiency. This is not mere conjecture but is based on the favorable experience with using planned color in power plants, dating back some 20 years.

Today then, when all industry is seeking means of operating more efficiently, there is little wonder that the use of color is receiving greater attention—especially since plant painting is generally an important item of expense and the cost of a planned color job usually is no more than that of painting solely for surface protection.

Tailor Made Programs

Making the best use of color requires that the color program be "tailor-made" for the specific plant. For that reason it is advisable to consult with a trained paint engineer. His knowledge concerning the colors best suited to meet the objectives of the planned color program will assure obtaining the results desired.

Color has been widely used in industrial plants where large numbers of people are employed and its effect on employee morale has generally been indicated in increased quantity and quality of production. Even though the power plant has fewer employees than some other types of industrial operation and the nature of the work is not so closely related to worker output, the reaction of the individual worker to color really is the basis for suggesting its use.

Aids Housekeeping

An orderly, clean plant usually mirrors good employee morale, pride in the plant, interest in the job. By the same token, the plant that is not well kept, that is allowed to run down is likely also to be the counterpart of workmen who are indifferent to their tasks and who in neglecting good housekeeping might just as easily become careless in their routine jobs.

The plant that is painted attractively gives workers a sense of pride in their surroundings and an inducement to keep it that way. When walls, pipes, valves, and walk rails are kept clean, chances are that the general attitude toward plant maintenance will be better. Equipment maintenance will be followed more closely and this helps bring about lower maintenance costs.

The costly result of poor housekeeping was forcefully brought to the attention of one power plant recently when a boiler feed pump motor broke down, seriously handicapping operations. An accumulation of moisture and dirt had caused a short-circuit which besides forcing a 24-hour shut-down, required that the motor be rewound. This same plant now is in the process of adopting a planned color program which is designed to help lessen such occurrences in the future. It will be painted in practical colors, light enough to show the dirt, so that there will be more likelihood of periodic cleaning.

Planned color is equally well suited for modernizing an existing plant or for use on new construction. When erecting a new plant, the advice of a paint engineer during the early architectural planning stage will prove extremely helpful.

Some of the factors which must be considered in determining a power plant color program are:

1. The design of the building.
2. The color of architectural materials in the building which are not to be painted.
3. Nature of machinery and equipment.
4. Illumination.

The general design of power plants follows a somewhat similar pattern. The whole setting—vast wall space, high ceilings, orderly layout, massive equipment—lends itself to effective color treatment.

Unlike with many other types of industrial buildings where the color may be determined with considerable freedom, materials previously selected for the power plant may be the chief factor restricting where, how, and what color of paint is to be used.

For example, many modern power installations are housed in buildings which have walls entirely of brick, tile or combinations of each. The fixed color of the tile or brick thus provides the guide post for the balance of the color scheme. The ideal color pattern will defi-

nitely blend the fixed color harmoniously with the rest of the plant.

Here is a typical situation with recommendation to fit:

Turbine Room

Walls to a height of about 50 feet are in iron spot brick above which are large glass block windows and ordinary red brick to the ceiling.

Structural steel supports for an overhead crane are partially imbedded in the side walls but project about two feet out into the room. The upper area of the room contains roof trusses supporting purlins and concrete roof deck. Principal equipment in the area includes the turbine generator and an overhead crane.

It is seldom practical or possible to match precisely the color of a building material such as brick, so color engineers usually attempt to do the next best thing. That is, to arrive at a color which will be harmoniously similar to the one on which the color scheme is to be based.

In this instance a blend of medium brown with a coral red resulted in a color quite suitable for the support columns along the walls. This treatment makes the projecting structural steel less obvious.

To give identity to the crane runway girders and the crane itself, these are painted in a warm tan. The same color is used for the roof trusses and purlins and the ceiling itself is white. This pattern follows the most common and acceptable plan of color usage which calls for a gradation of brightness in color, with the darkest shade for floors, a lighter color for the sidewalls, and the lightest color for the ceiling.

Coral red, chosen as an accent color, is reserved for the crane trolley and cab. The crane pulley and hook are finished in lemon yellow so as to attract attention to a potential hazard.

The turbine generator in this instance is silver gray, a neutral color, which harmonizes well with the background color of the wall. The generator base is set apart from the main portion by painting the base a dark turquoise.

Handrails and the outside face of stringers of metal stairs are finished in coral red while the stair steps are done in gray stone floor enamel.

Boiler Plant and Draft Plant

Side walls of this area are similar to the turbine room. Structural columns and bracing are thus finished in a medium brown, tinted with coral red.

Overhead floor beams and girders are painted ivory the same color as used on the underside of the concrete floor slabs they support. This color gives maximum light reflection and the use of it on the structural steel makes these girders less noticeable.

The boiler wall, coal bunker and air heater are done in beige with medium brown on the base elements. The purpose of this color choice is to provide better light and also to solicit continuous housekeeping. The structural frame of the boiler is finished in brown to harmonize with the sidewall.

Graystone floor enamel is suggested for steel grating floors because it is considered fairly light as an overhead color, but dark enough to be serviceable as a floor enamel.

The stairway railings as well as the outside faces of stairway stringers use coral red while the treads and inside faces of the stringers are in gray stone enamel.

The main portions of large equipment, such as blower fans and the pulverizer unit are done in medium brown with auxiliary equipment like driving motors in coral red as an accent.

Smaller equipment such as boiler feed pumps is finished in silver gray although the medium brown and coral red combination would also be satisfactory.

The bottom of the coal bunker is done in beige, with the lower six feet of the bunker in medium brown. The coal scales are finished in a cinnamon brown for easy cleaning and because it does not show coal deposits so prominently.

Beige is recommended as a color for piping and air tubes. True, this color shows the accumulated dirt but the fact that it must be kept clean to look right is an influence toward keeping the plant in condition.

Sub-Operating Floor

This area is distinctly apart from the main portion of the plant. Because of location it is dependent entirely on artificial light. Good appearance is also important.

An ivory tint is recommended for the ceiling with ivory on the upper walls and a brown dado. Overhead piping and pipes along the wall will be in ivory.

Equipment in this setting will be the medium brown and coral red combination.

Machine Shop

The machine shop usually is an important part of the power plant. The recommendation for the ceiling is white with ceiling steel the same color. Walls are iron spot brick so that the medium brown and coral red combination applies for the steel supports along the wall.

Machine shop equipment affords an opportunity to use a modern machine color scheme. One choice for the machines is a silver gray with moving parts silhouetted with ivory. This introduces a change of pace, using a "cool" color (gray) where elsewhere through the plant warm colors have predominated. Another, more colorful effect would be obtained by using medium blue on the machines, with moving parts silhouetted in ivory. Where a machine has a base, it would in this case be brought out by painting a dark blue.

Exterior Colors

Use of color on exterior equipment such as transformers and circuit breakers also is often desired. Where the adjacent buildings are in red brick and the transmission frame is galvanized iron, forest green makes an attractive and practical color.

No Blanket Recommendation

The foregoing example of applying planned color is not intended to be a blanket recommendation for all power plants. Yet it illustrates how specific requirements can be and are met.

Color is a powerful new tool for the use of industry. Every power plant will do well to investigate its practical application.

Helping the MAN-IN-THE-PLANT

Readers are invited to send in kinks, ideas, and suggestions. Payment is made for all material accepted.

Gravity Balance Device Detects Air in Gas Stream

EVERY possible precaution is taken by the UNITED GAS PIPE LINE CO., SHREVEPORT, LA., to keep oxygen out of pipe lines—gas without oxygen is not combustible; but a proper gas-air mixture requires only a spark to produce an explosion that can rip a pipe line, compressor, or meter station apart.

The illustrated oxygen detector, developed by United Gas Pipe Line's J. R. BIRD and gas measurement and research departments, detects the presence of air in the gas stream and when it is present to shut off the gas flow. It is essentially an Ac-Me gravity balance in which an additional view lens has been mounted on each side of the cylinder.

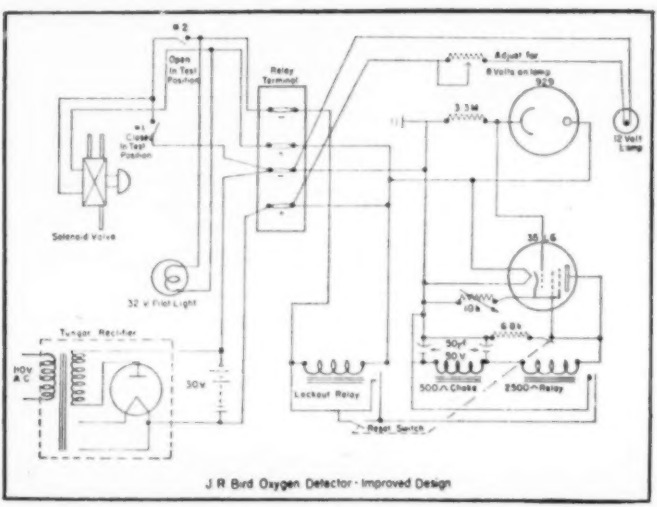
A photoelectric light source and relay unit are mounted on a metal plate, which is attached to the gravity balance cylinder. The light beam can then be directed through the cylinder and the two lenses to the relay unit, where the electrical control circuits operate a solenoid valve which in turn controls other valves.

The control functions of the relay are actuated by a target attached to the gravity balance arm in such manner as to cut the light beam passing through the cylinder as a predetermined setting. It is battery operated in order to insure operation of the oxygen detector independent of power line failures.

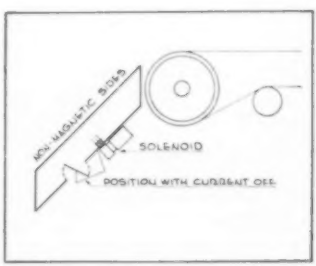
A suitable test circuit permits a routine procedure in checking the operation of all phases of the oxygen detector, except the solenoid pilot valve, without interrupting the normal gas flow.

The operation of this unit has been highly satisfactory for the past year, and the detector has proved more practical than utilizing instruments which offer a time lag and a lack of dependability resulting from current interruptions. The gravity balance device reacts instantaneously to any change in the specific gravity of gas and has no electric motor to be kept in operation.

O. C. IRVINE
United Gas Log.



J R Bird Oxygen Detector - Improved Design



Trapping the Infrequent Iron Fragment

ESPECIALLY in the manufacture of food products, even a single metallic piece such as a small nut or nail, may involve the manufacturer in a costly damage suit.

Instead of an expensive magnetic conveyor head pulley, the simple trap-door device shown in the illustration, often is suitable. A powerful solenoid in series with the motor circuit, magnetizes a short section of the floor of the chute. Just beyond is the pivoted flat, lever-connected so that when the solenoid is energized it is held shut. When the conveyor is started, the plate slaps shut, and the solenoid traps any stray iron fragment flowing down the chute. When the motor circuit is opened, the flap drops, and a few seconds later the trapped particle slips down and out.

W. G. HUDSON

WHEN WE SAY WeldELLS *have everything!*

WE MEAN:

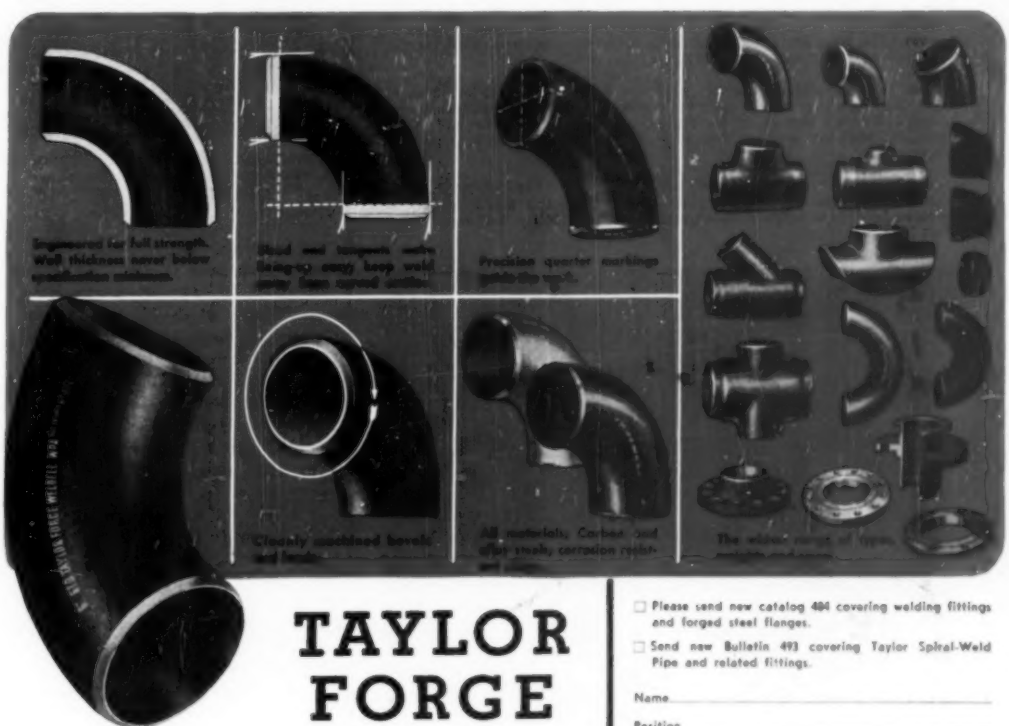
Everything in balanced and practical design . . . Engineered strength distribution; close limit metallurgy; uniform and geometric dimensional accuracy.

Everything in utility and convenience . . . Clear, complete identifications; quarter markings that speed up easy accurate lineups; cleanly machined bevels that mean faster, sounder welding; forge-sized end tangents for extra convenience.

Everything in materials . . . Carbon steel; carbon or chrome molys; stainless 304, 347, 316, and the rest of the family; nickel; Monel; Inconel; wrought iron; aluminum; and other usual industrial materials.

Everything in range of type, weight, and size . . . Fittings forged and formed seamless in the entire size range from ¾" to 30" and larger when required; in all weights for *any* service condition; with companion range of forged (or forged and rolled) flanges of every type—in all ASA size and pressure series, or beyond to 96" diameter and more.

All of these are combined only in the WeldELL line. Why accept less?



TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS General Offices & Works: Chicago 90, Ill. (P.O. Box 485). Eastern Plant: Carnegie, Pa. Western Plant: Fontana, Calif.

District Offices—New York: 50 Church Street • Philadelphia: Broad Street Station Bldg. • Pittsburgh: First National Bank Bldg. • Chicago District Sales: 208 S. LaSalle Street • Houston: City National Bank Bldg. • Los Angeles: Subway Terminal Bldg.

☐ Please send new catalog 484 covering welding fittings and forged steel flanges.

☐ Send new Bulletin 493 covering Taylor Spiral-Weld Pipe and related fittings.

Name _____

Position _____

Company _____

Street Address _____

City _____ Zone _____ State _____

Mail to Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.

758-150

Boiler Cleaning Cost Reduced

APPRECIABLE savings in boiler cleaning costs, outage time, and improvement in boiler efficiency have been accomplished by a large Southwestern gas plant through the use of the Beco-Cell system, manufactured by Brown Electro Company of Oklahoma City.

An analysis of cleaning costs with the new Brown descaling cells as compared with the old method indicates approximately 50 per cent reduction.

Prior to inaugurating the present method of controlling the scale, the tubes were rattled after each 90 operating days. The time consumed to do this work required that the boiler be off the line for at least 24 hours. Therefore improvement in the operating factor of the boilers should be credited as well as reduction in repair cost and labor.

Fabric-Walled Welding Booth

Vinyl-coated cloth woven of Fiberglas yarns is used for the four sides of a new welding booth in the main plant of Tube Turns, Inc., Louisville, Kentucky, manufacturer of welding fittings and flanges.

The cloth, known as Fibrylon and manufactured by The Holton Corporation, New Orleans, is suspended by hooks from a rod frame made to the size of the work area. It is weighted at the bottom to prevent flapping and clears the floor by about one inch, allowing air to circulate freely and carry off fumes and heat.

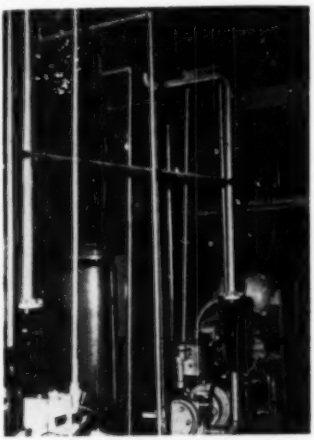
The cloth is noncombustible and has high tear strength. It is, in addition, moisture proof, mildew resistant, cleanable, colorfast and durable, doesn't stretch or shrink, and because of its inorganic composition, will not rot or decay. It is resistant to most acids and alkalies.

Advantages of the new booth are: Low cost, compared with metal enclosures of the same size; quick access from any angle; ability to receive large size work without difficulty; portability, and more comfort for the welder.

NONCOMBUSTIBLE AND TEAR RESISTANT FIBRYLON FOR WELDING BOOTH ENCLOSURES HAS THE ADVANTAGE OF LOW COST, COMPARED WITH METAL ENCLOSURES OF SAME SIZE.

Snubbing Pipe Vibration

TO eliminate vibration and consequent damage to the junction between the discharge lines from two compressors, one engineer devised a brace which snubbed the pulsations and cut out the harmonic vibrations which were set up in the risers from the compressor discharge valves.



INSTALLATION OF THIS BRACE ELIMINATED VIBRATION. TIGHT JOINTS ARE NOW MAINTAINED IN DISCHARGE LINES.

The brace was a piece of 1½-inch pipe, cut to fit closely the curve of the two discharge lines, and measured to fill the gap between the lines at their mid point. Welded on ears on the space provided attachment for ½-inch nuts, welded in place in line with 9/16-inch holes through the ears. Caps or stirrups formed to fit outside the pipe, and drilled with 9/16-inch holes to match those in the ears on the spacer pipe, allowed the assembly to be clamped tightly in place.

Since fitting the brace, no vibration was noticeable in either riser, and no trouble was experienced in maintaining tight the joints in both discharge lines.

Being easily removed by loosening the caps, the brace did not interfere with the shifting of either discharge line in case it was necessary to change valves or clean them.

ELTON STERRETT
Houston, Texas

SPEED OF INSTALLATION is one of the important advantages of Densheath thermoplastic-insulated Type TW building wire.

Special, super-slick Densheath finish is designed to slip through conduit quickly and with the least possible effort.

Fast, clean stripping (yet high resistance to cutting and abrasion) takes less time on the job.

Light weight makes light work. Small diameter means more copper per conduit—points that save *hours* and *dollars*.

Densheath is quick to sell, too, because of its long-aging quality . . . high tensile strength . . . resistance to fire, common acids, alkalies, oils . . . low moisture absorption.

We will be glad to tell you more about Densheath, or to supply your needs—with the greatest of speed. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U. S. Pat. Off.

THE DENSHEATH ADVANTAGE IN REWIRING WORK

3 #10 Wires permitted in ½" conduit

TYPE R

6 #10 Wires permitted in ½" conduit

TYPE TW (ANACONDA DENSHEATH)

National Electrical Code recognizes Densheath for circuits to 600 volts, temperatures to 140° F., and for wet and oily locations.

ANACONDA
from mine to consumer

Densheath*

THERMOPLASTIC TYPE TW BUILDING WIRE

NEWS
FOR SOUTHERN INDUSTRY

New Pipe Mill—Orange, Texas

The Consolidated Western Steel Corporation (USS) recently confirmed that the General Services Administration at Washington, has sold to Consolidated certain surplus government facilities at Orange, Texas, constructed by the Navy during the war and formerly operated by Consolidated as a wartime shipyard.

The acquisition of these facilities at Orange will make it necessary for Consolidated to locate its new large diameter pipe mill at Orange instead of at Houston, as previously announced.

The new facilities will provide an annual capacity of 100,000 net tons of 24-in. diameter and larger electric welded and expanded steel pipe to aid in the further industrial development of the Southwest.

Flexitallic—Atlanta

FLEXITALLIC GASKET CO. of Camden, N. J., announces the appointment of BOILER EQUIPMENT SERVICE COMPANY, 686 Greenwood Ave., N. E., Atlanta, Ga., as agents for Alabama, Florida, Georgia, North Carolina, and Tennessee.

◆

Geo. P. Reintjes Appointment

GEO. P. REINTJES COMPANY, 2517 Jefferson St., Kansas City, Mo., arch and wall manufacturers, announces the appointment of INTERSTATE SALES, INC., Arcade Bldg., St. Louis, Mo., as representative in the St. Louis area.

MR. FRANK WEYFORTH, president of the Interstate Sales, has had many years of experience in the sale of refractories in the St. Louis area, especially in the steel mills, oil refineries, and industrial power plants.

◆

FUTURE EVENTS
Of Engineering Interest

SOCIETY OF PLASTICS ENGINEERS, INC., Richard L. Huber, Chmn., Hercules Powder Co., Cleveland, Ohio.
Jan. 11-13, Annual Technical Conference, Hotel Carter, Cleveland, Ohio.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS and **SOCIETY FOR THE ADVANCEMENT OF MANAGEMENT**, Clapp and Poliak, Inc., 341 Madison Ave., New York 17, N. Y.
Jan. 16-19, Plant Maintenance Show, Auditorium, Cleveland, Ohio.

SOUTHERN ASS'N OF SCIENCE AND INDUSTRY, INC., Headquarters, 5009 Peachtree Road, Atlanta, Ga.
Jan. 23-24, Science-Agriculture-Industry Conference, Hotel Roosevelt, New Orleans, La.

SOUTHWEST AIR CONDITIONING EXPOSITION of the International Heating & Ventilating Exposition and the 56th Annual Meeting of the American Society of Heating and Ventilating Engineers, Charles F. Roth, Mgr., International Exposition Co., Grand Central Palace, New York, N. Y.
Jan. 23-27, State Fair Grounds, Dallas, Texas.

NATIONAL PLASTICS EXPOSITION, Dale Amos, Chmn. of Exposition Committee, Amos Molded Products Co., Edinburg, Ind.
Mar. 28-31, Navy Pier, Chicago, Ill.

Winston-Salem Air Conditioning School

Fred Boxall, right, explains the electric controls for Bahnson Company air conditioning systems to J. R. Sedgefield, of Alpargatas, textile manufacturers of Montevideo, Uruguay. Mr. Sedgefield came to Winston-Salem, North Carolina to attend a special air conditioning school conducted by the Bahnson Company for engineers and maintenance men. More than a hundred attended the two, week-long sessions.

M&H Valve & Fittings Co. Appoints Gabosch

CHAS. S. MARTIN, Pres., M & H VALVE & FITTINGS COMPANY, Anniston, Ala., has announced the appointment of CHESTER P. GABOSCH as Sales Manager of the company.

◆

Continental Gin—East Tennessee

CONTINENTAL GIN CO. of Birmingham, Ala., announces that CARY SHOEMAKER has been transferred from field sales in the Birmingham area to Knoxville, Tenn., as Sales Engineer in the company's Industrial Division on conveying, elevating, and power trasmission equipment. Mr. Shoemaker will travel the East Tennessee area and is temporarily located in the Andrew Jackson Hotel. Mail: P. O. Box 1821, Knoxville.

After his Mechanical Engineering training at Alabama Polytechnic Institute, Class of '41, Mr. Shoemaker entered the service in 1942, leaving as Captain, Corps of Engineers, in 1947. He has been with Continental since leaving the service and has been active in various phases of the Engineering and Estimating Departments.

SEATLESS MEANS ECONOMY

IN BOILER BLOW-DOWN SERVICE

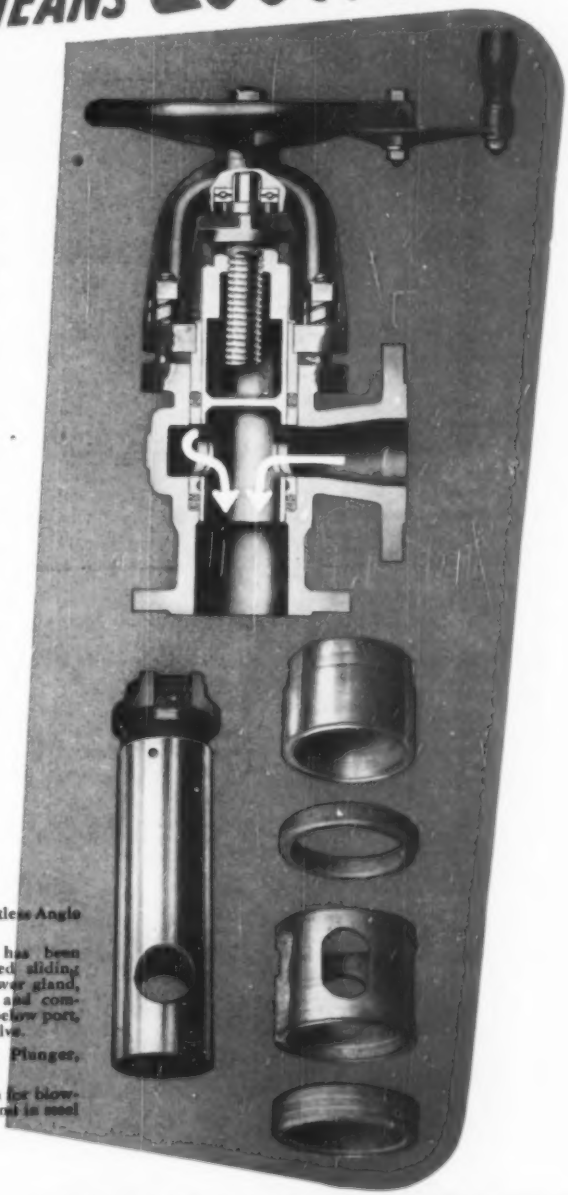
Because they eliminate the commonest source of trouble and expense in ordinary blow-off valve service, Yarway *Seatless* Blow-Off Valves mean real economy to boiler plant operators. *Yarways have no seat to score, wear, clog and leak.* Lubrication is usually the only maintenance they require.

Yarway introduced the seatless principle with the balanced sliding plunger many years ago . . . has constantly improved and adapted it to meet modern service requirements. Mechanical and metallurgical research in Yarway's own Steam Laboratory anticipates changing conditions . . . keeps Yarway valve design ahead.

There is a Yarway Seatless Blow-Off Valve for every pressure. Iron body for 50 to 200 lbs., steel body for higher pressures.

SEND FOR FREE BLOW-OFF VALVE BOOKLET. PLEASE INDICATE THE PRESSURE OF YOUR BOILERS.

YARNALL-WARING COMPANY
Home Office: 116 Mermaid Ave., Phila. 18, Pa
Southern Representative: Roger A. Martin
Bona Allen Building, Atlanta 3, Ga.



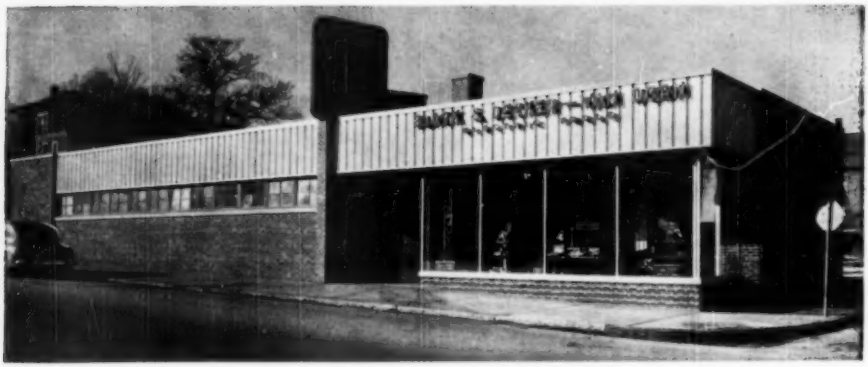
(*Above*)—Cross section of Seatless Angle Valve, flanged.

OPERATION: After valve has been closed, shoulder on balanced sliding plunger contacts upper follower gland, forcing it down into body and compressing packing above and below port, making an absolutely tight valve.

(*Below*)—Balanced Sliding Plunger, Packing Rings and Glands.

Yarway Valve is made in iron for blow-off pressures up to 200 psi., and in steel for pressures to 400 psi.

YARWAY BLOW-OFF VALVES



Black & Decker — New Atlanta Office

THE BLACK & DECKER MFG. CO. of Towson, Maryland, has moved its Atlanta Factory Sales and Service Branch to a new building at 316 Techwood Drive, N. W., Atlanta 3, Georgia. MR. A. LEE PROCTOR is Atlanta branch manager.

This brand new building was built to the specifications of this manufacturer of portable electric tools and offers greatly increased facilities for the prompt, efficient servicing of Black & Decker, Van Dorn and Home-Utility products. Besides being manned by factory-trained personnel to repair and service the products of the company, the Atlanta Branch has a large show room to display a wide range of portable electric tools. Also ample parking space has been provided at the new location for the convenience of customers.

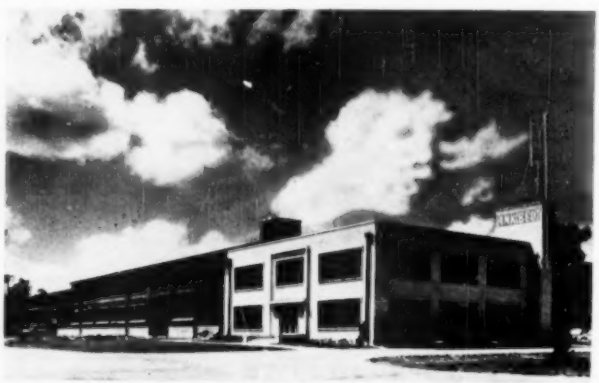
This is the latest in the company's program of modernizing and expanding its nationwide network of "factory-service" branches now consisting of 29 locations in the U. S. and Canada.

Link-Belt Company's Houston Plant

Opening of the Link-Belt Company's new manufacturing plant at 3203 South Wayside, Houston, Texas, was reported in a previous issue of SP&I.

The 45,000 sq ft Houston plant, built to better serve the ever-expanding industries of the Southwest, includes a one-story, all steel factory building with three bays, and a two-story office section of masonry construction in front.

Mr. Allan Craig, formerly located at the Link-Belt plant in Atlanta, is general manager of the company's Southwestern Division, with headquarters at the new Houston plant.



American Brake Shoe Appointment

WILLIAM J. GRANT has been appointed Southern Sales Manager for the NATIONAL BEARING DIVISION OF AMERICAN BRAKE SHOE COMPANY. His headquarters will be in the Southern States Building in RICHMOND, VIRGINIA.

Mr. Grant, formerly Sales Representative for the company's Brake Shoe & Castings and Southern Wheel Divisions, has been with Brake Shoe since 1940. He attended Georgia Military Academy and is a graduate of Georgia Institute of Technology.

◆

National Carbide—Louisville

NATIONAL CARBIDE CORPORATION has appointed GEORGE R. MILNE as vice president. Mr. Milne is in charge of operations, and will continue to have his headquarters in LOUISVILLE, KENTUCKY, in order to remain close to the company's manufacturing operations.

RUSSELL T. LUND has been appointed operating manager, responsible for operating practice, procedure and methods at all plants. He will report to Mr. Milne and will remain at Louisville, where he will function as the works manager in addition to his other duties.

Other appointments announced were those of ASTOR BROWN who became acting works manager at IVANHOE, VIRGINIA and CLARENCE G. BUBNHAM who became controller.

MR. PULS
(Pacific Pumps)

Pacific Pumps—Southeastern Representative

HUGO A. PULS, P. O. Box 9021, Birmingham, Alabama, has recently been appointed as sales representative in the Southeast for PACIFIC PUMPS, INC., Huntington Park, California. Mr. Puls was previously connected with the Ingalls Companies in sales and purchasing capacities and for the past several years has functioned as director of purchases.

◆

Carboloy—Baltimore

THE CARBOLOY COMPANY, INC., of Detroit has announced the appointment of the W. L. REYNOLDS COMPANY, 502 W. Franklin St., Baltimore, Maryland, as an additional authorized distributor for cutting tools, grinding wheels, and abrasives.

◆

Reynolds Metals—Listerhill Plant

REYNOLDS METALS CO., 2500 S. Third St., Louisville, Ky., has launched an $8,000,000 expansion program in its Alabama operations, with the expansion of foil and cable production at the Listerhill Plant, Listerhill, Ala.

Construction and installations are under way at the REYNOLDS ALLOYS COMPANY plant in the Muscle Shoals area. M. A. J. PHILLIPS is Vice President and General Manager of this company, and BASIL HORSFIELD is Vice President of REYNOLDS METALS COMPANY, in charge of all aluminum reduction operations.

The expansion includes the installation of new Lewis foil mills, General Electric annealing ovens, and modern high speed processing units, the largest of the new buildings will house the cable plant which includes new cable mills and twenty new stranding machines.

Here's Why

Darts Don't Drip

SPHERICAL GRINDING forms the seats of a Dart union into a true ball joint. Bearing surfaces are wide, precision-matched to lock the leaks without excessive wrenching.

TWO BRONZE SEATS are non-corroding . . . designed to last for years without a leak.

RUGGED CONSTRUCTION of practically indestructible high-quality, air-refined malleable iron shrugs off tough service and brutal wrenching.

See your supplier today for these better life-time unions by DART.

DART UNIONS

E. M. DART MFG. CO.
Providence 5, Rhode Island

Technical Books

Electrical Engineers' Handbook

EDITED BY HAROLD PENDER AND WILLIAM DEL MAR
PUBLISHED BY JOHN WILEY & SONS, INC. 440 - 4th Ave., New York 16, N. Y.
6 x 8½ inches—1716 pages.
Price $8.50.

This fourth edition of the Pender handbook retains all the features which highlighted earlier editions, and at the same time it has been enlarged and completely rewritten for increased usefulness.

Vol. I (Electric Power) discussed here comprises 19 sections. Vol II now in preparation will deal separately with communications and electronics.

Vol. I is divided and subdivided for easy reference and clarity. Increased attention has been given to subjects that have become more important in recent years. Notable among these on the theoretical side are circuit stability and symmetrical components. And among items of equipment: electronic rectifiers, heat pumps, plastic insulating materials, induction and dielectric heating, etc. The engineer can also refer to this volume for dependable information on: lighting and heating, properties of materials, lamps and illumination, insulated wires and cables, air conditioning, and many other power and industrial subjects.

This first volume retains the same basic data presented in previous editions on subjects such as mathematics, units, and symbols, properties of materials, electric circuits, electric lines, principles of electrochemistry, measurements, etc.

◆

Weld Design

BY H. D. CHURCHILL AND JOHN B. AUSTIN
PUBLISHED BY PRENTICE-HALL, INC. 70 Fifth Ave., New York 11, N. Y.
5½ x 8½ inches—216 pages.
Price $6.65.

Weld Design is intended to supply a definite need for a concise volume on welded machine-base design. The process of fabricating machine bases by arc-welding is being applied to many types of designs, and many engineers are aware of its advantages, but in many instances they are unable to proceed because of a lack of welding design experience and information.

To supply the needed information, this volume treats the subject of design from both the practical and theoretical standpoints. And, furthermore, it gives necessary information on the materials that enter into machine base construction, and a clear picture of the method of processing plates and structural shapes. The presentation is based on the concept that welding design is largely dependent on a proper choice of components, and the designer should understand fabrication methods Therefore the authors have avoided going into great detail on the subject of welding technique, and they suggest that a welding manual be consulted for such information.

◆

Review of Current Research and Directory of Member Institutions

PUBLISHED BY ENGINEERING COLLEGE RESEARCH COUNCIL. State University of Iowa, Iowa City, Iowa.
6 x 9 inches—186 pages.
Price $1.75.

Over 4000 current college and university research projects in engineering subjects, representing expenditures of over $35,000,000, are listed by title in the 1949 Review of Current Research, published by the Engineering College Research Council of the American Society for Engineering Education.

Entries in the book from 82 educational institutions which held membership in the Research Council describe the administrative policies for conducting engineering research and list the responsible personnel, research expenditures, short courses and conferences of special interest, and the titles of all engineering research studies currently active at each institution.

Use of the volume is facilitated by a breakdown of research projects according to the engineering departments involved, and by a complete index to research project subjects.

WHY fireye

fireye's southern district representatives invite you to see the answer at the Fireye exhibit of the . . .

Southwest Air Conditioning Exposition

Dallas, Texas — January 23-27

Remember the booth—No. 255

And if you can't attend the show . . . call your district representative today. One of the following will be glad to pay you a visit if you'll phone him.

Atlanta, Ga.	Spotswood Parker Co. 313 Techwood Dr. N.W.
Charleston, W. Va.	G. H. Zimmerman Co. Atlas Building, P.O. Box 1306
Charlotte, N. C.	Royster H. Johnson Co P.O. Box 1831
Dallas, Tex.	L. R. Ward Co. 2711 Commerce St.
Kansas City, Mo.	F. D. Moore 106 E. 14th St.
Louisville, Ky.	Richard Equipment Co. 633 So. 5th St.
Memphis, Tenn.	A. T. M. Gas Equip. Co. 1132 Exchange Building
New Orleans, La.	David A. Warriner 7920 Zimple St.
Philadelphia, Pa.	Daniel F. Nichols 1245 Broad St. Station Bldg. (Serving Baltimore and Washington)
Roanoke, Va.	Carroll G. Traylor Co. 2241 Maiden Lane
St. Louis, Mo.	Norman W. Kathrinus & Co. 1218 Olive St.
Tampa, Fla.	Industrial Spec. Sales Equip. Co. 1707 Grand Central Ave.
Tulsa, Okla.	Snyder Co. 1001 North Wheeling St.

fireye
COMBUSTION CONTROL CORP.
Flame Failure Safeguards for Oil and Gas Burners
77 BROADWAY, CAMBRIDGE 42, MASS.

WHY fireye

There's only one reason for putting a Flame Failure Safeguard on an oil or gas burner . . . to prevent an explosion . . . to safeguard your entire plant, equipment, and personnel.

Fireye insures complete flame failure protection because it is photoelectric . . . it sees the flame . . . and if the flame fails, Fireye acts with the speed of light to cut off the fuel *before* dangerous gases accumulate in the combustion chamber.

Controls which do not reset instantaneously can not provide full protection . . . for it is the few seconds of delay between flame failure and fuel shutoff which charge the combustion chamber with potential destruction.

Fireye is the outstanding combustion safeguard which meets the exacting requirements of insurance laboratories for the protection of ALL classifications of oil and gas burner installations.

FACTORY MUTUAL FM APPROVED

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COMBUSTION CONTROL CORP.

77 BROADWAY, CAMBRIDGE 42, MASS.

R & M CRANES GIVE WINGS *to Boiler Company Steel*

In the huge Huntington Boiler and Supply Company, loads of steel are constantly on the move. For fast, efficient, safe handling, these people use one 10-ton and two 5-ton Robbins & Myers electric overhead traveling cranes. From cars to storage, storage to work area, these R & M "giants" speed daily production schedules, help create a better profit picture.

CRANES, HOISTS, WINCHES FOR EVERY JOB

Powerful R & M units are available for lifting services from ¼ ton to 25 tons. Many standard crane variations: gantry, overhead I-beam cranes, plus special designs for unusual applications. Also quality hoists and winches engineered for lasting service. Choice of control, suspension and capacity.

We are always glad to analyze your requirements and quote without obligation. Write for further information and free literature.

ROBBINS & MYERS • INC.

SPRINGFIELD 99, OHIO • BRANTFORD, ONTARIO

MOTORS • HOISTS • CRANES • FANS • MOYNO PUMPS

Conveyors and Related Equipment

By Wilbur G. Hudson
Published by John Wiley & Sons, Inc. 440 - 4th Ave., New York 16, N. Y.
6 x 9 inches—468 pages.
Price, $7.00.

This second edition of a well known book serves as a guide to the factors which must be considered when buying, equipping, operating, and maintaining conveyors and related devices. A well rounded content of material, diagrams, and photographs make this edition an accurate and comprehensive treatment of the field.

The author describes the use and application of screw conveyors, flight and apron conveyors, chain and bucket elevators, belt and bucket elevators, skip hoists, pivoted bucket carriers, overhead trams and conveyors, en masse conveyors, pneumatic, hydraulic, and belt conveyors, and aerial tramways. Besides reporting on the different types of equipment, he analyzes them from the standpoint of how well they will deliver the goods.

◆

Industrial Electronics

By Andrew W. Kramer
Published by Pitman Publishing Corporation, 2 West 45th St., New York 19, N. Y.
6 x 9 inches—311 pages.
Price $6.00.

This book explains the fundamental principles of electronics without extensive use of mathematics, and shows how these principles are applied in industry. It tells what electron tubes are, how they work, and how they were evolved.

The book is designed particularly for the practical man in the industrial plant who wants to know how electronics may be used for improvement in his own operations. For those already using electronic equipment, this book supplies necessary information on the operation and maintenance of such equipment in terms that can be clearly understood.

◆

Diesel Engines

This new Second Edition of DIESEL ENGINES by J. Edgar Anderson is a practical treatment showing what Diesels are, what they do, how

to select them for specific purposes, and how to operate them. It gives a comprehensive picture of American engines and some European, classifying them according to general service applications, explaining principles of installation, maintenance, and operation. It discusses engine designs and principles, fuel oil injection, fuel oils, engine applications, etc. in the light of current practices and trends. Emphasis is on mechanical injection because of current trends. Chapters are provided on special phases such as: lubrication systems, governors, cooling systems, etc., as well as: operation and maintenance, performance and cost of operation, and aids to the selection of an engine.

Published by THE McGRAW-HILL BOOK COMPANY, 330 West 42nd St., New York 18, New York. Price, $7.00.

◆

Log Log Slide Rule

MANUFACTURED BY PICKETT & ECKEL, INC. 5 South Wabash Ave., Chicago 3, Ill.

Price $14.00 with felt carrying case, or $14.75 with imitation leather case.

This new all metal engineering 10-inch Log Log Slide Rule is said to be simplified by its new "double scale". The long-established traditional log log scale arrangement is simplified through the use of a new double, or "back-to-back" scale. This new scale is claimed to accomplish four things not done before in slide rules:

1. It places the six Log Log "Mated Scales" together to make three double scales, with numbers and their reciprocals back-to-back for greater accuracy and easier reading.
2. It provides the extra area needed to place C scales on both sides for easier operation, without enlarging the rule.
3. It permits inclusion of the much needed DI scale, which is often omitted.
4. The white or blank space saved by using back-to-back scales not only permits addition of the extra C and DI scales, but transforms the complex looking maze of lines on the traditional Log Log arrangement into a simpler, easier to use, easy to understand rule.

The all metal construction of the Pickett rule permits precision manufacture, close tolerances, and maximum freedom from inaccuracies.

Improved Combustion-Reduced Ash Pit Losses

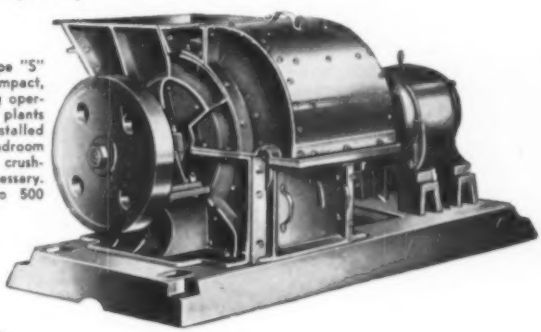
through low cost uniform coal sizing

with AMERICAN

ROLLING RING

CRUSHERS

With the increased costs prevalent today, obtaining the maximum BTU yield from every pound of coal becomes more important. To achieve efficient firing—uniform coal reduction is essential. All grades of ROM coal are uniformly reduced to stoker or pulverizer sizes by American Rolling Ring Crushers with minimum fines and no oversize—at a cost of less than 1c per ton. Uniformly crushed coal results in lowered CO_2 loss and reduced ash pit drop.



The American Type "S" Crusher is a compact, complete crushing operation for power plants which can be installed in minimum headroom with no auxiliary crushing facilities necessary. Capacities up to 500 TPH.

Only American Rolling Ring Crushers have the patented manganese steel shredder rings that split coal instead of crushing it. Revolving freely on individual shafts they deflect without damage from tramp metal, eliminating need for shear pins or conventional safety devices.

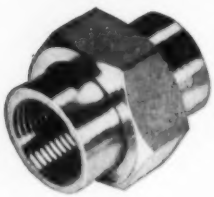
Send for the facts on efficiency of coal preparation in power plants with American Crushers.

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1243 MACKLIND AVE.
ST. LOUIS 10, MO.

SAVE
ON STAINLESS!



Camco
Stainless Steel Fittings
Turned from
Bar Stock
COST NO MORE
than Competing
Cast Fittings...

NOTE THESE SPECIFICATIONS

- Cylindrical Fittings up to and including 2" I.P.S. are machined from bar stock.
- Elbows and Tees up to and including ¾" I.P.S. are machined from drop forgings.
- Companion and slip-on Flanges up to and including 2" I.P.S. are machined from drop forgings.

WE MAINTAIN

Complete stocks from ⅛" to 4" I.P.S. inclusive in types 304, 316 and 347 stainless steel. Prompt delivery.

If your local jobber cannot supply you with CAMCO fittings, write today for name of nearest distributor.

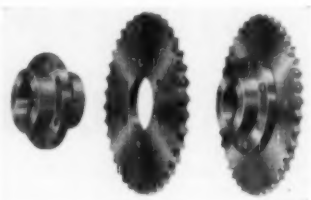
CAMCO PRODUCTS INC.

25 Fox Street
New Haven 15
Connecticut

NEW EQUIPMENT

Roller Chain Sprockets

A-1 THE FORT WORTH STEEL & MACHINERY CO., 3600 McCart St., Ft. Worth, Texas, have announced a new line of stock demountable hub roller chain sprockets. Practically any speed ratio desired can be obtained from these stock sprockets, which are manufactured in a pitch range from one-half through one and three-fourths inch.



The new style "D.H." (demountable hub) sprocket is made up of a steel plate sprocket, bored and drilled, to which a machined cast iron hub is attached by heat treated cap screws. The bolt holes in the hub are threaded. Hubs are carried in stock with bores in increments of one-sixteenth inch between the minimum bore size; one-half inch—up to the maximum bore size of four and seven-sixteenths. Bolt holes in both plates sprocket and hub are jib drilled to permit interchangeability.

◆

Jackstacker

A-2 LEWIS - SHEPARD PRODUCTS INC., 265 Walnut St., Watertown 72, Mass., have recently added to their line of Jack-Stackers, the Walkie Electric Trucks for both horizontal and vertical movement of unit loads. This counterbalanced fork type is designed for loads up to 1000 pounds 48" long, is made in telescopic and non-telescopic models, with fork elevations up to 130", and is 46½" less forks. The compact design makes it useful in confined areas and where aisle space must be kept to a minimum.

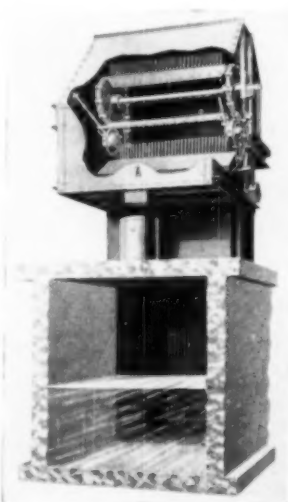
Screen

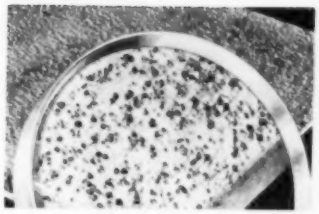
A-3 LINK-BELT COMPANY, 307 N. Michigan Ave., Chicago 1, Ill., is manufacturing a new screen known as the Thru-Clean Bar Screen, for removing trash and large solids from water and sewage at water, sewage, and industrial waste treatment plants.

The primary elements of the screen are a permanently supported rack of vertical steel screen bars and a power operated screen-bar-cleaning mechanism employing two endless parallel strands of "C" Class combination chain, between which are fastened two or more steel rakes at evenly spaced intervals.

The rake teeth engage the screen bars through the screen rack from the downstream side, and are moved upwards through the screen bars to the discharge point, where the screenings are discharged by a pivoted, counter-weighted mechanical wiper plate.

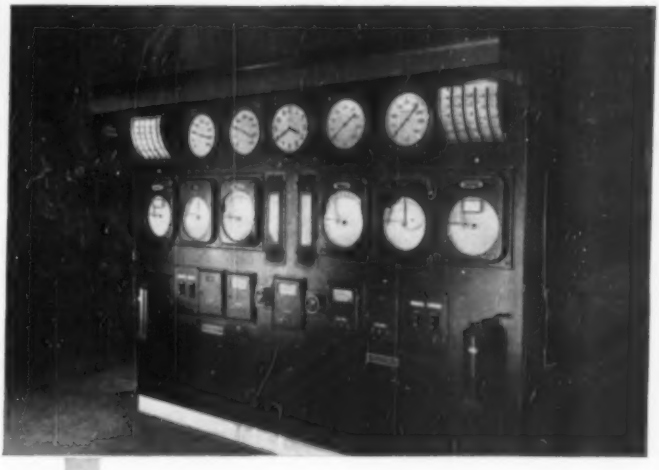
Screenings are discharged on the upstream side of screen rack to a belt conveyor for disposal elsewhere, or into a trough from which they can be raked by hand into either a shredder or a screenings can located directly under the steel plate enclosure of the head of the machine.





Non-Skid Floor Plate

A-8 ALAN WOOD STEEL COMPANY, Dept. W-116, Conshohocken, Pa., has introduced abrasive rolled steel floor plate for industrial use. The new floor plate is being marketed under the trade name A. W. ALGRIP. It is especially effective when used for industrial floors, loading platforms and ramps, walkways, building entrances, and for trench and hatch covers. The manufacturer recommends it for use wherever there is danger of injury to personnel through slipping on floors. Its non-slip characteristic is retained as the surface wears, because new abrasive particles are constantly exposed.



THIS HAYS
combustion control
QUICKLY PAID FOR ITSELF

How to get more steam to meet the demands of steadily increasing production, with all three boilers in continuous operation: that was the problem at General Mills' plant in Paris, Illinois.

A Hays Automatic Combustion Control System with full instrumentation was installed—and the problem ceased to exist. Production went up sharply from 12,500 bushels per day using three boilers, to 22,500 bushels per day using only two boilers—with the third for standby. Combustion is smokeless, velocity of gases was reduced, operating pressure is higher and turbine steam consumption dropped 1000 pounds per hour. CO_2 averages 15 percent as against the previous 7 percent; boiler efficiency rose from 55 to 78½ percent. Steam costs dropped sharply. The Hays system quickly paid for itself.

Records like this of Hays performance are not exceptional; and indicate that it's good business to *find out* about this modern electrical system, to investigate *what it will accomplish for you* in improved production and lower costs.

Talk over your plant's steam requirements with a Hays engineer—no obligation, of course. And write for Publication 47-605: worth reading.

THE HAYS CORPORATION • MICHIGAN CITY 4, INDIANA

HAYS Automatic COMBUSTION CONTROL
INDUSTRIAL INSTRUMENTS · INDUSTRIAL CONTROL · FLOWMETERS · GAS ANALYZERS · DRAFT GAGES · CO_2 RECORDERS

Clog-Proof Trash Pump

A-9 FAIRBANKS, MORSE AND COMPANY of Chicago, Ill., recently demonstrated its new clog-proof trash pump to visiting engineers and trade paper editors at its Beloit works. An entirely new bladeless impeller developed by R. C. Glazebrook, Chief Engineer of the company, is responsible for the revolutionary clog-proof features which were demonstrated.

Free Reader Service

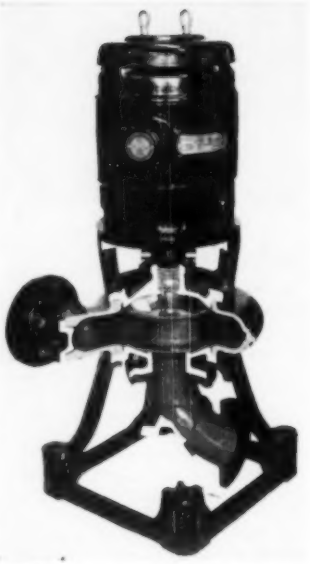
For additional data on new equipment described on these pages, circle numbers desired on the service coupon post card provided on page 10.

BLADELESS IMPELLER WITH THE FRONT SHROUD REMOVED.

Blades of previous impeller designs for such service were responsible for much of the clogging which plagues sewerage disposal plants, especially those which must handle large concentrations of fibrous trash. The company said that its new impeller design was kept secret several years while service tests were under way in several plants where extremely severe conditions existed. The operators of these plants maintained careful performance records of the pumps before and after the change-over, and report that the bladeless impeller has reduced their trouble and maintenance expense to a small fraction of that formerly encountered. The bladeless impeller handles trash ten times the size which clogs blade type pumps.

The company also expects its new pump to receive wide acceptance in the handling of food products because they can transfer solids in foods with less damage than in previous designs.

Efficiency and operating characteristics of the new pump compare favorably with previous trash pump designs when consideration is given to the greatly reduced maintenance cost, and improved operational qualities. The impeller contains a single channel without blades, and the pumping effect is obtained by so twisting and warping the channel as to produce the equivalent of one flow section of a conventional impeller.



CUTAWAY MODEL OF VERTICAL CLOSE COUPLED BLADELESS TRASH AND SEWERAGE PUMP.

◆

R. H. MORSE, JR., VICE PRESIDENT OF THE COMPANY AND R. C. GLAZEBROOK, DESIGNER OF THE NEW PUMP ARE SHOWN HOLDING A WORKMAN'S COAT AND A PAIR OF PANTS WHICH WERE PUT THROUGH THE PUMP BEHIND WHICH THEY ARE STANDING.

Portable Power Tools

A-10 STOW MANUFACTURING CO., Binghamton, N. Y., has developed two new power units—the Jiffy Tool and the Speed Jiffy. These low-cost, portable machines are designed for use in shops and plants. Both can be used for polishing, routing, brushing, grinding, buffing, drilling, filing, sanding, and a variety of other jobs.

The Stow Jiffy Tool is a 3-caster floor model, delivering ¼ hp at 1750 rpm through a 5' flexible shaft. The motor unit operates on a 100 volt, 60 cycle, single phase ac lighting line. Both 1/3 and ½ hp units are available at higher cost.

For more complex operations, the Speed Jiffy has three speed variations—1000, 1750, and 3000 rpm. These velocities are obtained by altering the plug-in position of the flexible drive shaft. The Speed Jiffy features an automatic tensioning belt, making belt adjustments unnecessary.

this FREE book

shows you how to cut cleaning costs

THAT 16-page Digest above describes 71 important power-plant cleaning and related procedures in which specialized Oakite materials help reduce cleaning time . . . simplify repair and maintenance work . . . cut the cost of descaling, degreasing and cleaning. Here's a quick run down of its contents:

- **use of Oakite materials in steam control systems**
- **how to prepare and use Oakite Compound No. 32 for equipment descaling**
- **use of Oakite materials in electrical power plants**
- **use of Oakite materials in Diesel power plants**

Under each of those headings is step-by-step information you'll be glad to have for economical answers to all your maintenance cleaning and descaling problems. Can you use a handy copy? Send your request to Oakite Products, Inc., 23A Thames St., New York 6, N. Y., and you'll have it by return mail. No obligation, of course.

OAKITE

OAKITE 1909 1949 40 ANNIVERSARY YEAR

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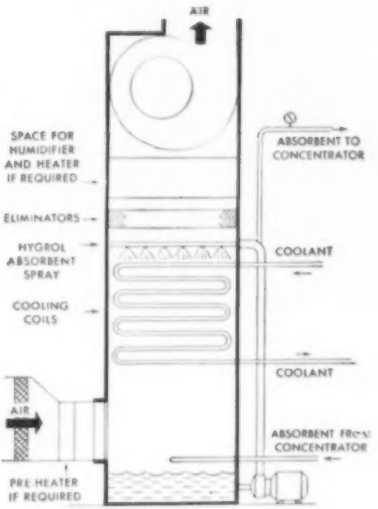
New Method Gives Precise Control in Air Conditioning

Niagara "Controlled Humidity Method" Uses Hygrol, Hygienic Liquid Absorbent

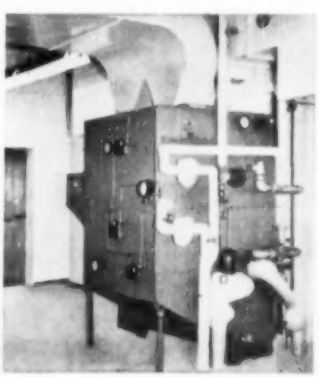


NIAGARA CONTROLLED HUMIDITY METHOD — FLOW DIAGRAM

● The Niagara "Controlled Humidity Method" is a new system of air conditioning giving complete control of temperature and relative humidity, holding constant conditions or varying them at the will of the user. Especially, it provides dry air at normal atmospheric temperatures with little or no refrigeration required. A condition of 15 grains of moisture per pound of air at 85 deg. F. dry bulb temperature has been produced without refrigeration.

The apparatus is enclosed in a casing thru which the air is drawn by fans. The air is filtered and then enters a chamber where it is dehumidified in passing thru a spray of "Hygrol" Liquid (a hygienic hygroscopic chemical that absorbs the air-borne moisture and contains no salts or solids to precipitate). In the same chamber are located cooling coils which remove the latent heat of evaporation and also sensible heat as required.

The absorbent liquid spray falls into a tank at the base, where it is piped to a concentrator, removing moisture taken from the air. The re-concentrated liquid returns to the system. This process is continuous, and the apparatus operates at full capacity at all times.

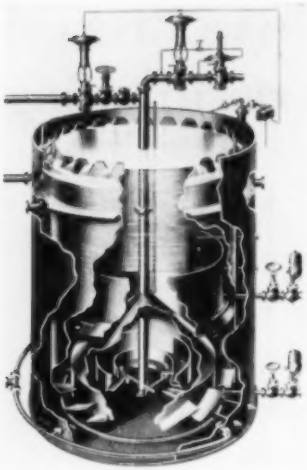


The same equipment may be used to provide winter air conditioning when required, by installing a tempering coil at the outdoor intake, an humidifier, and a reheat coil above the eliminators.

This equipment is manufactured in a range of sizes providing from 1000 to 20,000 CFM of conditioned air from a single unit, and mutiple unit installations are practical. It is expected that, by reducing the need for refrigeration, the cost of air conditioning will be reduced by this method. Applications generally are in a temperature range from 35 deg. F. upward. Below the freezing temperature of water the Niagara "No-Frost" method is applicable.

The equipment is protected by U. S. and foreign patents. Installations have been made in food and chemical process industries, in packaging hygroscopic products, for preventing condensation of moisture on metals and other products in storage, in air conditioning for laboratory control and for human comfort.

For further information, write Niagara Blower Company, Dept. SP, 405 Lexington Ave., New York 17, N. Y.



employing hydraulic energy for mixing the applied chemicals with previously formed precipitate. Thus optimum flocculation is achieved without the use of submerged mechanical moving parts within the softener.

Complimentary recirculation of treated water maintains a uniform depth of slurry bed independent of load demand.

Where filters are used for final clarification, a washer reclamation compartment is incorporated to enable the filters to be economically backwashed with clean, chemically inert water without imposing increased flow rates through the softener. Density of the slurry bed is automatically and proportionately maintained.

◆

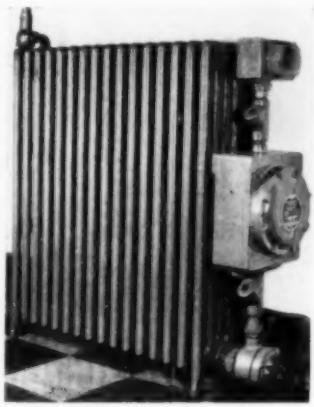
Water Softener

A-11 WORTHINGTON PUMP AND MACHINERY CORPORATION, Water Treating Section, Dunellen, N. J., has announced a new cold process slurry type precipitating water softener and coagulator

Electrically Heated Radiator

A-12 THE L. R. WARD COMPANY, 2711 Commerce St., Dallas, Texas, have announced their Warco explosion proof electrically heated radiator for offices, shops, and relief stations in hazardous locations. The units are designed to meet the space heating requirements where inflammable gases, liquids, and dusts are present.

The radiator provides a non-inflammable heat transfer liquid to conduct the heat from the immersion heater to the radiating surfaces of the unit. An integral thermostat is provided to control the maximum temperatures of the radiator. Since



the thermostat contacts are inadequate for breaking the heater load, and since any auxiliary room thermostat or other control would not have adequate contact rating to break the heater load, a magnetic contactor is provided as an integral part of the unit.

The heating capacity of the unit is 20,200 Btu per hour (6 kw) and the heater may be connected for 220/230 three phase, or 440/460 single-phase operation.

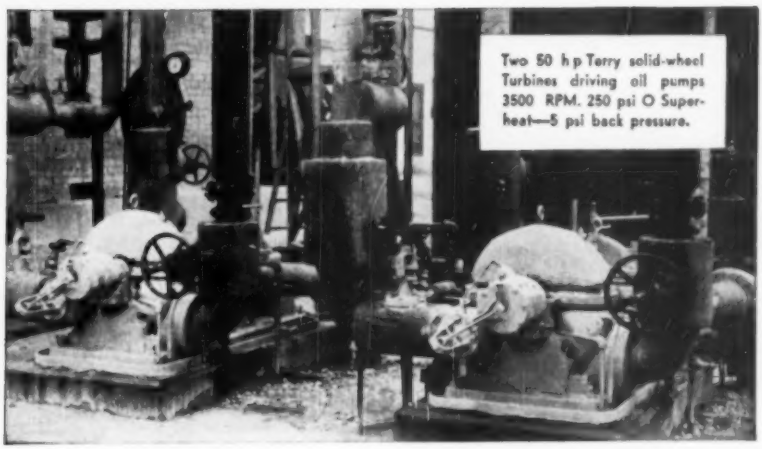
◆

Surface Pyrometer

A-13 THE PYROMETER INSTRUMENT CO., INC., Bergenfield, N. J., has developed a new Pyro surface pyrometer for determining surface and sub-surface temperatures in industrial plants and laboratories.

This new instrument features a 4" direct reading indicator mounted in a rubber cushioned housing. Two series of models offer either a rigid extension arm or a 42" flexible arm suitable for use with any one or more of a selection of eight types of available thermocouples. Each series is available in four temperature ranges from 0-400 F to 0-1200 F, and all thermocouples may be interchanged without adjustment or recalibration.

TERRY



Two 50 h p Terry solid-wheel Turbines driving oil pumps 3500 RPM. 250 psi O Superheat—5 psi back pressure.

LARGE BLADE CLEARANCES GIVE ADDED DEPENDABILITY

Terry Turbine blades have the protection of generous radial and axial clearances. Axial clearance is so large — a full inch — that end play can do no damage.

Projecting rims at both sides of the wheel give further protection to the rotor buckets. Should clearance become reduced, these rims will take rubbing without damage to the blades.

This construction also makes frequent inspection of thrust bearings unnecessary.

A request on your business letterhead will bring you Terry Bulletin S-116 giving detailed information about these features and other Terry Turbine advantages.

If you have a specific turbine drive job in mind, our district Terry representative will be glad to discuss it with you.

T-1174

THE TERRY STEAM TURBINE COMPANY
TERRY SQUARE, HARTFORD, CONN.

METALOCK

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CARDS

Plastic for Floor Repairs

A-16 THE MONROE CO., INC., Dept. 117-2, 10703 Quebec Ave., Cleveland 6, Ohio, is offering a new plastic-type floor material, which is said to withstand a 50,000 pound load one minute after application. The product, known as Swift-Floor, can be used either for patching wood or concrete floors, or for complete resurfacing of aisleways, loading platforms, ramps, and driveways.

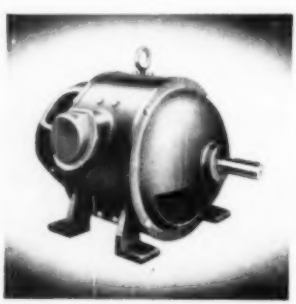
The material is designed for use by factories, mills, transportation companies, and other industries. No experienced labor is required for application. The plastic is set by compression rather than evaporation; thus, the more traffic that flows over it and the heavier the load, the smoother and harder the floor becomes. It is packed in 55-gallon lever-top drums, ready for use. No mixing is required.

◆

D-C Life-Line Motors

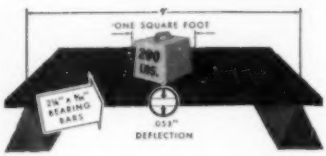
A-17 WESTINGHOUSE ELECTRIC CORPORATION, Pittsburgh 30, Pa., have announced the new Type SK, direct-current Life-Line motors, in 1 hp to 30 hp ratings. These new motors retain the basic design of earlier SK motors, but feature the same all-steel construction used in the a-c Life-Line motors. Heavy steel end brackets provide maximum strength, rigidity, and correct bearing alignment.

Pre-lubricated sealed-for-life ball bearings provide effective lubrication and reduce maintenance. The new motors, in frames 203 to 365, are available for constant, adjustable, or varying speed applications, for either continuous or intermittent service. They can be supplied with shunt, compound, or series windings, depending upon the use intended. They are designed for operation from 115, 230, or 660 volts.



For STRENGTH specify

TRI-LOK
RECTANGULAR
OPEN STEEL FLOORING

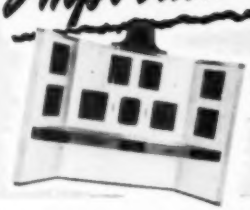


The locked-in strength of Tri-Lok enables it to stand up under heavy loads—even on long spans. No rivets, bolts, or welds are used in the construction of Tri-Lok; this feature eliminates the possibility of loose joints.

Tri-Lok is also available in Diagonal, or Super-Safety U-type Flooring, and in Stair Treads of all types. Write for Bulletin KN 1140.

DRAVO CORPORATION
National Distributor for the Tri-Lok Company
Dravo Bldg., Pittsburgh 22, Pa.
Sales Representatives in Principal Cities

GAGEBOARDS are Important

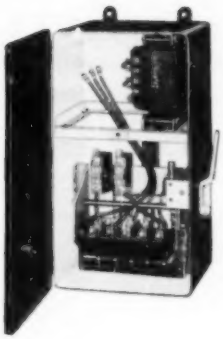


. . . important because only a fine gageboard can give the extensive power or processing project the final crowning touch of over-all efficiency that it deserves.

. . . and when you are ready to figure on gageboards, figure on FALSTROM—pioneer in new panelboard design and construction!

. . . write for Bulletin 119 on Power and Processing Gageboards

FALSTROM COMPANY
47 Falstrom Court, Passaic, New Jersey
ENGINEERS • DESIGNERS • FABRICATORS SINCE 1870



Starter for Squirrel-Cage Motors

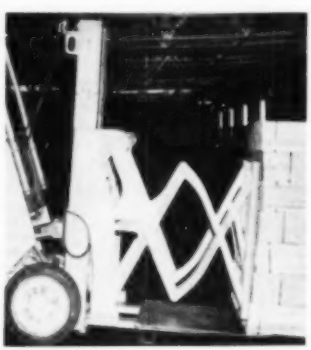
A-18 THE ALLEN-BRADLEY COMPANY, Milwaukee, Wis., is now offering a new manual, autotransformer-type starter for squirrel-cage motors. It is available in four sizes from 5 hp, 220-440-550 v, to 250 hp, 440-550 v; for 25, 50, and 60 cycles. The switch mechanism operates with a quick-make, quick-break action. Two automatic reset overload relays are standard equipment in all starters. The new line comes in Form T, with air-break contacts; and Form X with oil-immersed contacts.

◆

Fork Truck Loading System

A-19 THE YALE & TOWNE MFG. CO., Philadelphia Division, Roosevelt Blvd. & Haldeman Ave., Philadelphia 15, Pa., announces the Pak-Loader Fork Truck System, which makes it possible to handle boxes, barrels, bales, drums, and cartons in multiple units without the use of pallets.

The Pak-Loader Fork Truck System comprises two components: fork trucks equipped with pusher mechanisms, and two or three specially adapted steel plates per fork truck. The steel plates are cut to the size which best fits the specific load to be handled. Legs about four inches high are secured to one end of the plate. When loading the plate, a block of wood is placed under the toe to keep it level. The forks of the truck slip under the plate for lifting. When unloading, the forks are tilted forward to rest the front end of the loaded plate next to the pile of goods already stored. As the pusher is extended, the truck moves backward. A locking device holds the steel plate on the forks and prevents it from being pushed off with the load. The plate is returned for reloading when the truck picks up another load. While the truck is taking a load to storage, or from storage to shipping, another plate is being loaded in readiness for the truck's return.



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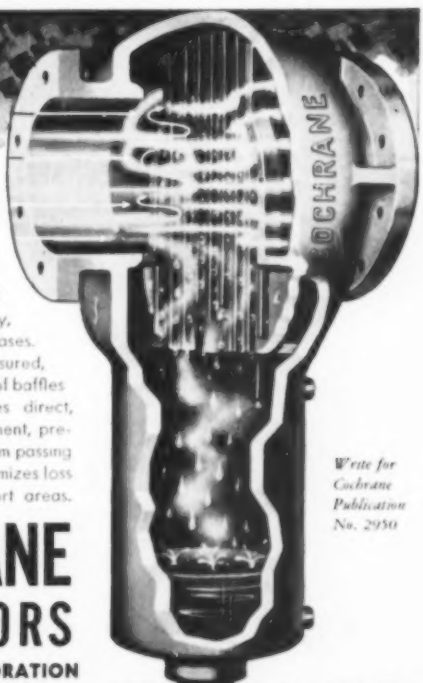
New Packaging Program

A-20 THE LINCOLN ENGINEERING COMPANY, St. Louis, announces a new packaging program developed to meet the need of industrial manufacturers and distributors for better inventory control, increased protection to parts, and better identification.

The sturdy metal-edge boxes give extra protection against crushing — and the boxes stack neatly, even after rough handling and repackaging. The contents of the package are individually heat-sealed inside a transparent, polythylene bag which protects the parts against dirt and moisture—prevents corrosion. Inside the bag is an identification card which carries the name and model number.

CLEAN DRY STEAM

COCHRANE All-Service SEPARATORS completely remove moisture and solid entrainment from dirty, oily, wet steam, air and gases. Complete purification is assured, due to an exclusive design of baffles and ports which produces direct, unrestricted fall of entrainment, prevents the purified steam from passing over the drip area, and minimizes loss by exceptionally large port areas.



Write for Cochrane Publication No. 2950

COCHRANE SEPARATORS

COCHRANE CORPORATION

3110 NORTH 17TH STREET • PHILADELPHIA 32, PENNA.

Silicone News

DC SILICONES

Here's How DC Silicone Insulation Reduces Motor Failure

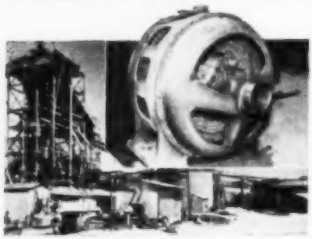


Photo courtesy Virginia-Carolina Chemical Corp.

THIS 300-H.P. silicone insulated motor was back in service three hours after being flooded with water, mud and waste.

● Engineers of Virginia-Carolina Chemical Corporation agree that DC Silicone Insulation is the best solution to motor failure caused by excessive moisture. They proved this in two identical 300-h.p. motors, one wound with Silicone (Class H) and the other with Class B insulating materials.

Located side by side and exposed to the same operating conditions, these motors are used to pump waste materials at the Phosphate Mine in Homeland, Florida. After the main line broke last year and flooded both motors with water, mud and waste, the Class B motor had to be reworked and rebaked. The motor wound with Class H insulation was simply cleaned with an air hose and the bearings were flushed out . . . ***Three hours later, the SILICONE INSULATED motor was back in service and operating perfectly.***

That confirms again the fact established by 4 years of motor testing: Class H Insulation made with Dow Corning Silicones has at least 10 times the life and 10 times the wet insulation resistance of the best insulating materials previously available. For more information on how silicone insulated equipment can save you time and money, phone our nearest branch office or write for booklet AH-13

DOW CORNING CORPORATION

MIDLAND, MICHIGAN

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In England: Albright and Wilson, Ltd., London

FIRST in Silicones

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CATALOGS AND BULLETINS

These free and helpful booklets are available for the asking.

Circle numbers desired on the page 10 service coupon post card.

B-10 **STEAM HUMIDIFIER**—Bulletin No. 1772, 12 pages—Covers complete line of steam humidifiers, including two new air-controlled models. Discusses dry air problems, tables on relative humidities and regain of hygroscopic materials, data on operation and installation of electric and air-controlled models.—ARMSTRONG MACHINE WORKS, Three Rivers, Mich.

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B-12 **CENTRIFUGAL PUMP** — Bulletin 812A, 12 pages—Instruction booklet on installation and operation of centrifugal pumps in corrosive service deals with proper location of pumps; foundations for pumps; correct alignment; priming standard pumps; piping arrangements; adjustment of impellers; common troubles and how to overcome them; friction data, formulae for figuring capacity, head and horsepower and conversion data.—THE DUIRON CO., INC., Dayton 1, Ohio.

B-13 **TURNING VANE AND VOLUME CONTROL**—Bulletin 30, 4 pages—Describes construction, installation and operation of the Turnotrol, a turning vane and volume control device for balancing heating, ventilating, and air conditioning systems. Illustrated with photographs, diagrams, and tables.—ANEMOSTAT CORPORATION OF AMERICA, 10 East 39th St., New York, N. Y.

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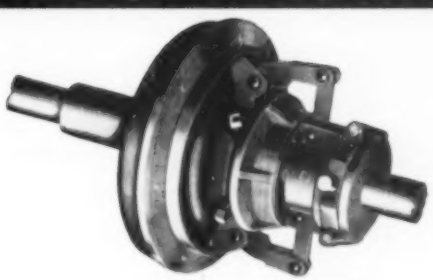

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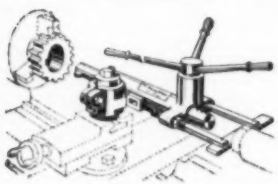

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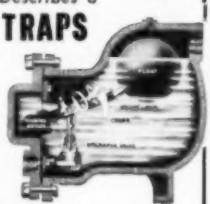

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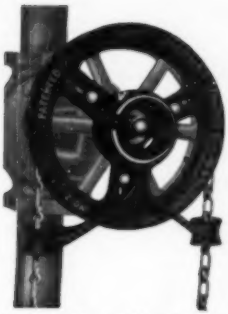

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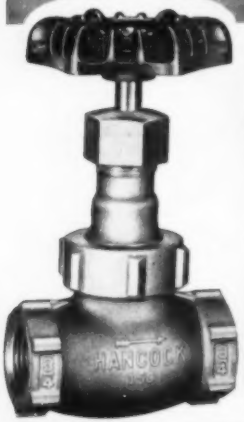

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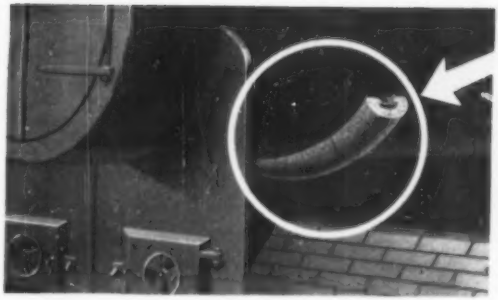

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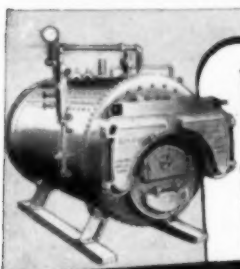

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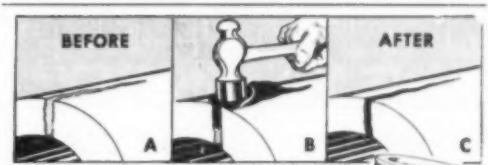

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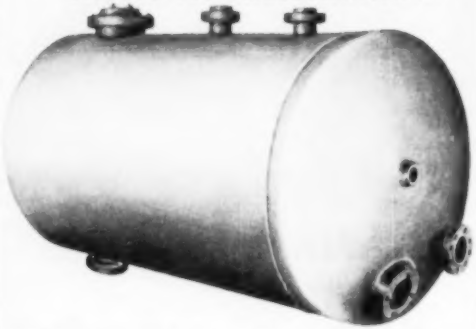

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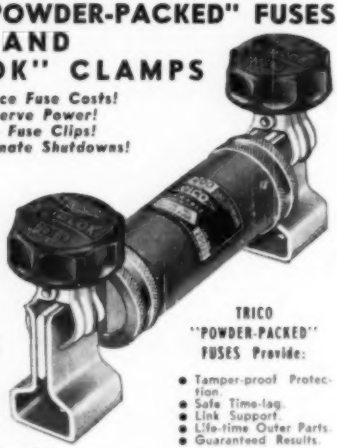

TRICO "POWDER-PACKED" FUSES Provide:

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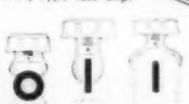
- Safe Time-lag.
- Link Support.
- Life-time Outer Parts.
- Guaranteed Results.



MAKE A TEST ON ONE CIRCUIT . . . YOU'LL CONVERT THE ENTIRE PLANT

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TRICO FUSE MFG. CO. Milwaukee, Wis.

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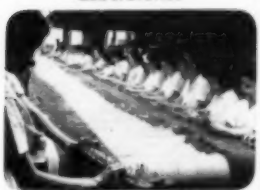
Baxter Laboratories, which have the largest production of intravenous solutions and blood transfusion equipment in the world today, use two Frick NEW "ECLIPSE" compressors for cooling the offices, research departments, and many work areas in their recently completed plant at Morton Grove, Ill. This covers 300 by 400 ft. Frick installation made by Midwest Engineering and Equipment Co., Sales Representatives in Chicago. When you want dependable air conditioning, refrigerating or ice-making equipment, engineered to your special needs, look to

Office and Plant are Modern Throughout

One of the Air Conditioned Laboratories



Assembling Expendable Transfusion Sets

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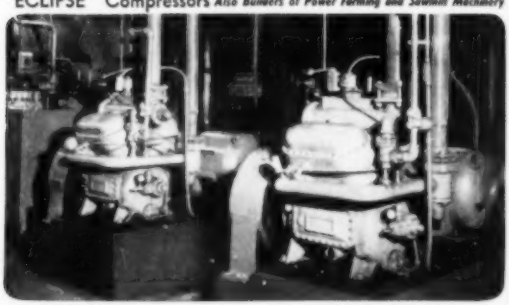
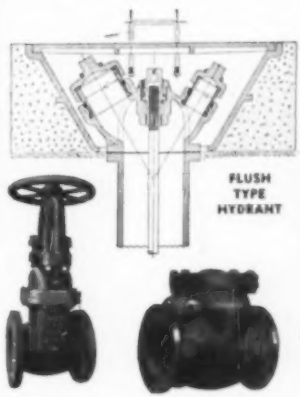
Two Frick NEW "ECLIPSE" Compressors *Also Builders of Power Forming and Sawmill Machinery*



PIPE LINE ACCESSORIES
for Water Works
Sewerage Systems
Fire Protection
Industrial Uses

VALVES HYDRANTS

Hub Ends—Mechanical Joints—Flanged or Screwed



M & H GATE VALVES are cast iron body, bronze mounted, with double-disc parallel seat or solid wedge type, non-rising stem or outside screw yoke. They come either with flanged or screwed connections. Valves for fire protection lines are marked "UA-FM" to denote approval of both the Underwriters and the Factory mutuals.

M & H FIRE HYDRANTS are revolving head, dry top, bronze mounted. They also are approved by "UA-FM". Entire main valve assembly is removable through barrel without digging. Special Traffic Model is fitted with breakable bolts and stem coupling, designed to break at ground line under impact. Repairs are made simply by renewing bolts and coupling, without shutting off the water.

M & H PRODUCTS INCLUDE

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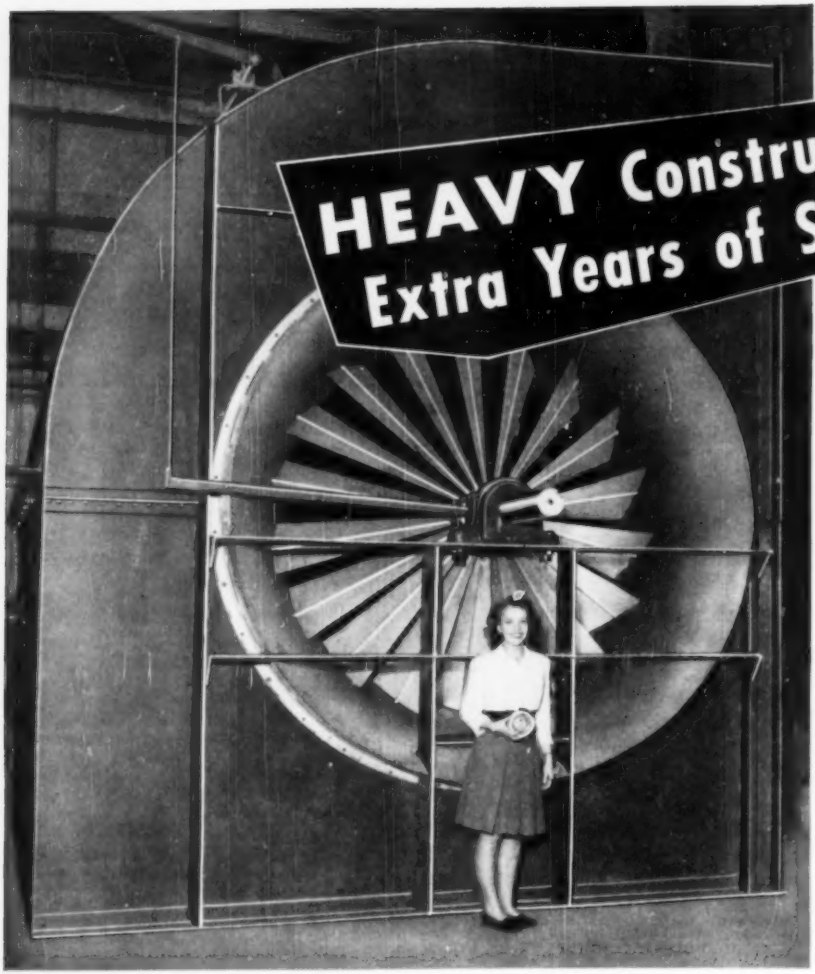
GATE VALVES	MUD VALVES
TAPPING VALVES	VALVE BOXES
WALL CASTINGS	FLAP VALVES
SPECIAL CASTINGS	SLUDGE SHOES
TAPPING SLEEVES	FLANGE AND FLARE FITTINGS
CHECK VALVES	FLANGED FITTINGS
FLOOR STANDS	R & S FITTINGS
EXTENSION STEMS	CUTTING-IN TEES

Water Works Catalog, No. 34
Fire Protection Catalog, No. 40

M&H VALVE AND FITTINGS COMPANY

ANNISTON, ALABAMA



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187,000 CUBIC FEET OF AIR PER MINUTE is this large fan's maximum capacity . . . size: 16 feet high, 12½ feet wide, 9½ feet deep — weight, 15,800 pounds. It is now operating in a woolen mill down South.

BUILT HEAVIER THAN COMMON PRACTICE, Clarage units — both large and small — are equal to the most severe conditions you can imagine in connection with air handling or conditioning installations.

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EQUIPMENT for many of the biggest, most important air handling jobs in this country is furnished by Clarage. Through the years architects, engineers, contractors, users have come to rely on Clarage equipment for long time service at operating and upkeep costs surprisingly low. May we work with you on your next project in our field?

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FAN COMPANY
Kalamazoo, Michigan

HEADQUARTERS for Air Handling and Conditioning

APPLICATION ENGINEERING OFFICES ..... IN ALL PRINCIPAL CITIES

JENKINS PRACTICAL PIPING LAYOUTS 46

How to plan a CLOSED FEEDWATER HEATER SYSTEM

The principal application of Closed Feedwater Heaters is in regenerative stage heating of boiler feedwater in steam power plants. They are also used widely in industrial buildings, schools, hotels, hospitals and other institutions to heat the service water.

When used to raise the temperature of boiler feedwater with exhaust steam, bleed steam or live steam as the heating medium, the Feedwater Heater is usually the closed type (as in layout).

Some of the steam passing through a power plant turbine is withdrawn at various stages and goes into its own Feedwater Heater. Here it gives up its latent heat, condenses and passes into a deaerator. From the deaerator, which is at atmospheric pressure, feedwater goes to the boiler feed pumps where the pressure is raised to that of the boiler. It then passes, at about 210°F., through a Closed Feedwater Heater (like the one shown) to be heated to the highest practicable temperature.

Consultation with accredited piping engineers and contractors is recommended when planning any major piping installation.

A CHOICE OF OVER 500 VALVES

To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering, select all the valves you need from the Jenkins Catalog. It's your best assurance of *lowest cost in the long run.*

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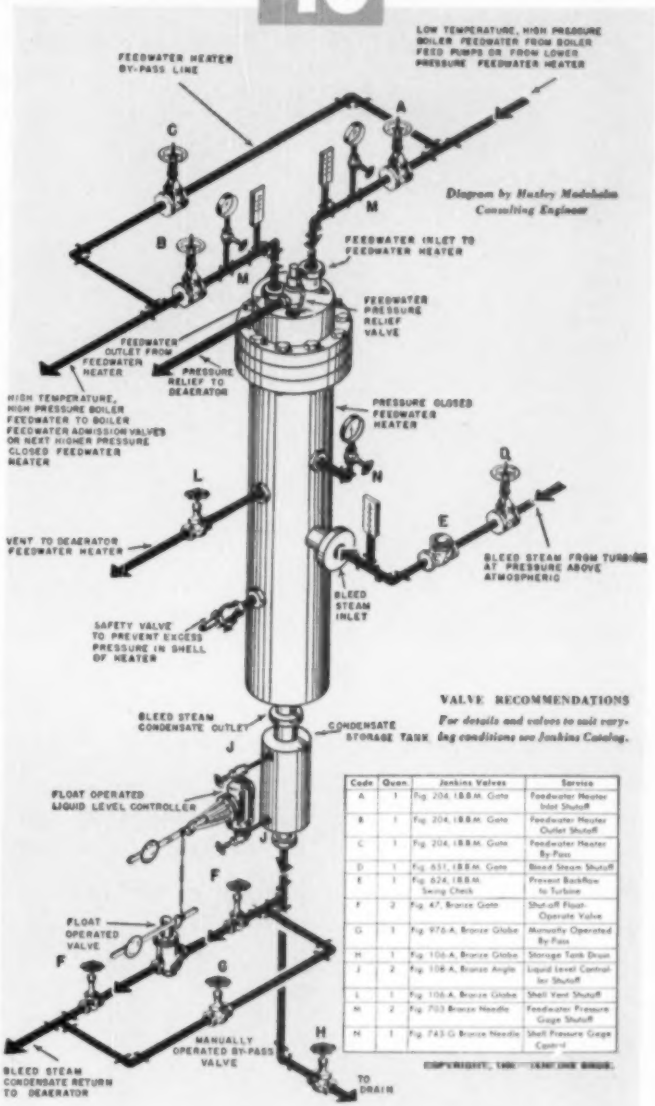
LOW TEMPERATURE, HIGH PRESSURE BOILER FEEDWATER FROM BOILER FEED PUMPS OR FROM LOWER PRESSURE FEEDWATER HEATER
FEEDWATER HEATER BY-PASS LINE
Diagram by Hussey Medebalm Consulting Engineer
FEEDWATER INLET TO FEEDWATER HEATER
FEEDWATER PRESSURE RELIEF VALVE
FEEDWATER OUTLET FROM FEEDWATER HEATER
PRESSURE RELIEF TO DEAERATOR
HIGH TEMPERATURE, HIGH PRESSURE BOILER FEEDWATER TO BOILER FEEDWATER ADMISSION VALVES OR NEXT HIGHER PRESSURE CLOSED FEEDWATER HEATER
PRESSURE CLOSED FEEDWATER HEATER
VENT TO DEAERATOR FEEDWATER HEATER
BLEED STEAM FROM TURBINE AT PRESSURE ABOVE ATMOSPHERIC
BLEED STEAM INLET
SAFETY VALVE TO PREVENT EXCESS PRESSURE IN SHELL OF HEATER
BLEED STEAM CONDENSATE OUTLET
CONDENSATE STORAGE TANK
FLOAT OPERATED LIQUID LEVEL CONTROLLER
FLOAT OPERATED VALVE
MANUALLY OPERATED BY-PASS VALVE
BLEED STEAM CONDENSATE RETURN TO DEAERATOR
TO DRAIN

VALVE RECOMMENDATIONS

For details and valves to suit varying conditions see Jenkins Catalog.

Code	Quan.	Jenkins Valves	Service
A	1	Fig. 204, 150 B.M. Globe	Feedwater Heater Inlet Shutoff
B	1	Fig. 204, 150 B.M. Globe	Feedwater Heater Outlet Shutoff
C	1	Fig. 204, 150 B.M. Globe	Feedwater Heater By-Pass
D	1	Fig. 651, 150 B.M. Globe	Bleed Steam Shutoff
E	1	Fig. 624, 150 B.M. Swing Check	Prevent Backflow to Turbine
F	2	Fig. 47, Bronze Globe	Shut-off Float-Operate Valve
G	1	Fig. 976-A, Bronze Globe	Manually Operated By-Pass
H	1	Fig. 106-A, Bronze Globe	Storage Tank Drain
J	2	Fig. 106-A, Bronze Angle	Liquid Level Control-ler Shutoff
L	1	Fig. 106-A, Bronze Globe	Shell Vent Shutoff
M	2	Fig. 703 Bronze Needle	Feedwater Pressure Gage Shutoff
N	1	Fig. 743 G Bronze Needle	Shell Pressure Gage Control

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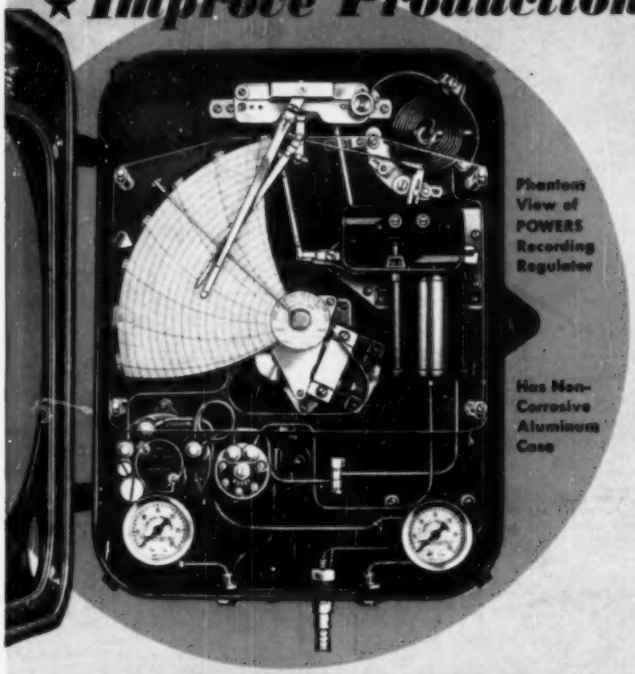
JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864

TRADE JENKINS MARK

★ REDUCE COSTS
★ Improve Production



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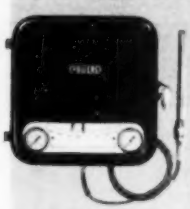
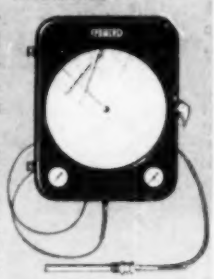
End losses caused by OVER-heating of processes or operations requiring precise control. Install POWERS pneumatic regulators. Their accurate control helps to improve quality of products—speed up production and save steam wasted by overheating.





Variety of Models: Recording Thermometers; Recording Regulators; Indicating Regulators; Wet and Dry Bulb Recording Regulators; Time Cycle Recording Regulators; Master and Sub-Master Indicating and Recording Regulators, etc.
Write for Bulletin 370.

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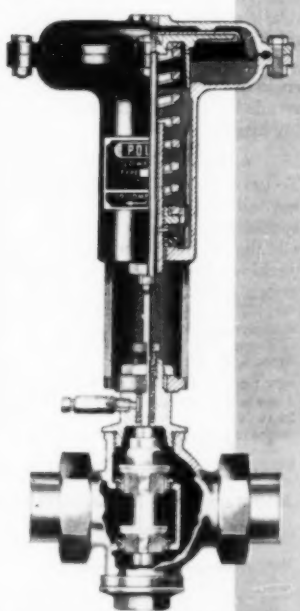
ABOVE: POWERS WET and DRY BULB RECORDING REGULATOR. Also available as a recorder only. Unit consists of two pen recording thermometer, water pan and motor blower causing sufficient circulation to give proper wet bulb readings.

ABOVE: POWERS TIME CYCLE RECORDING REGULATOR. Cam with cam follower operates steam control valve to correspond with any pre-determined time temperature schedule. Recording thermometer chart record provides a check on the operation of the control.



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ABOVE: POWERS FLOWRITE VALVE